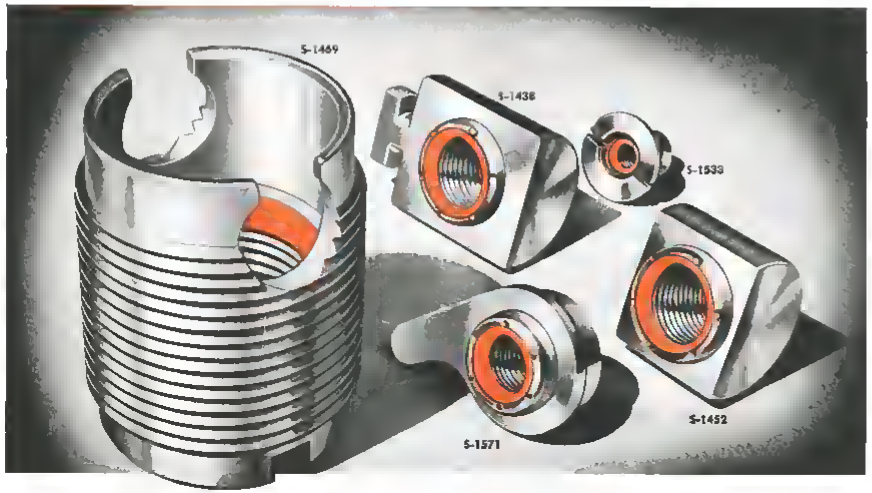
AVIATION WEEK

A McGRAW-HILL PUBLICATION

JAN. 30, 1950

Fastener Problems complicated by space limitations OVERCOME WITH ESNA SELF-LOCKING FITTINGS



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The spider and the flier

ENGINEERS call it the "spider" brake, because of its spider type frame. But the new frame is only one of the big improvements in this new-design B. F. Goodrich Expander Tube brake... seen above on the Boeing Stratocruiser.

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Aviation Week

Volume 52 — January 30, 1950 — Number 5

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WHO'S WHERE

Changes

► **New Appointments**—Wright Aeronautical Corp has named **Donald R Morse** controller Bert Lyna has been appointed director of advertising and public relations for Western Air Lines **Burt S Burke** is now manager of Westinghouse Electric Corp's Lighting division Electric Storage Battery Co has named **Leland E Wells** chief engineer **Robert B Hotz's** new title at Pratt & Whitney is public relations manager He resigned from AVIATION WEEK Jan 1

H M Byrnes, formerly director of publications for American Airlines is now director of admissions of the Academy of Aeronautics, Inc LaGuardia Airport Avco Manufacturing Corp's Lycoming Spencer division named **R. J Cowden** sales manager for engines and related products **Perry W. Pratt** is now assistant chief engineer at Pratt & Whitney Aircraft **Daniel E Anderson** has been appointed public relations director for the Los Angeles City Department of Airports **J Carlton Ward Jr** is doing part time technical advisory work for Laurance Rockefeller's aviation interests

Bell Aircraft Corp has named **Roy J Sindstrom** chief engineer **A. C. Thompson** has been named production manager for Koppers Co Inc's Metal Products division **Michael J Morse** has become division operations manager for National Airlines His headquarters will be at New York International Airport (Idlewild) **Charles I Kirk Jr**, and **Emmett J. Gearhart** are now in Tokyo as senior traffic representatives for Northwest Airlines **J F Barbour** is manager of the Small Motor division's aircraft department at Westinghouse

Willard Storage Battery Co named **Clarence H Endress** chief engineer KLM promoted **Captain J J Moll** to the rank of commodore on the Indonesian route

► **Sales Shifts**—Fairchild Aircraft division has named **Robert W. Kellhofer** manager of its sales and service department succeeding **L. J Fovey**, who becomes assistant director of customer relations of the Fairchild F & A Corp. Trans World Airline has named **Samuel Henry, Jr** and **H G Riegner** as assistant advertising directors in a staff shuffle of titles and duties Elastic Stop-Nut Corp named **Robert F. Fettig** district manager for the Michigan sales area

Elections and Honors

G K Griffin assistant to the president of American Airlines has been elected vp-personnel, marking the establishment of that department at the same organizational level as other company departments He has been with AA 22 years **George F. Stoll** and **C S Harding Mott** have been named to the board of Budd Aviation Corp Piedmont Aviation Inc elected **Frank Dowd** a director **Stanley Meyer** has been elected a member of the board of Colonial Airlines **Eugene Barry** and **James M. Landis** were not re-elected because of other interests

INDUSTRY OBSERVER

► **Another deluxe version of the Lockheed C-121 Constellation, described as even fancier than the "Dewdrop" executive plane assigned to Air Force Secretary Symington is reported undergoing modifications at Burbank for delivery in Washington soon to Symington's boss, Defense Secretary Johnson**

► Pan American World Airways offered to sell its Convair Liners to TWA at a price which might change the status of the continuing sales battle between Martin and Convair to provide TWA's new twin engine transports Last week it appeared the deal was off at least temporarily

► **Some final drop tests on landing gear and an engine test run are all that are now needed for CAA certification of Bob Fulton's two-place 150 hp flying car He has the first four production Airphibians on the line at Continental, Inc, Danbury, Conn**

► That unspecified $6 3 million USAF contract to Pratt & Whitney in November includes an order for 356 Wasp Major R-4360 engines of advanced design, presumably the long-awaited VDT version

► **Because the reserve program for government-owned machine tools is not maintaining tools in condition for immediate operation, a delay of almost a year would be caused before many of the stored tools could be returned to service if needed in emergency, a recent survey by an aviation engineer reported The reserve tools are torn down, cleaned and reassembled, but no defective parts are replaced or ordered. They are merely listed, to be ordered when the machines are reactivated**

► An advanced version of GE's J-47 engine, considerably more powerful than the 5200 lb-thrust production J 47 (probably around 8,000 lb thrust) is being groomed Meanwhile, Allison apparently still has the edge in power with its new J 35 23 turbojet, quoted by some sources as having 9200 lb thrust

► **Air Materiel Command is making available a limited number of non-flyable Bell F-63 Kingcobra fighters of World War II to public service non-profit institutions and organizations for use as war memorials. Planes are shipped FOB, Hill AFB, Ogden, Utah California Aeronautics Commission is one of the agencies acting as clearing house for the distribution.**

► Expansion of a runway at Hensley Field, Dallas, to 7500 ft will enable Chance Vought Aircraft to do its test flight work there beginning next April, instead of taking newly completed F7U Cutlass Navy jet fighters up to Ardmore, Okla, where flight tests have been run

► **Hufford Machine Works, Redondo, Calif, is now building two giant new stretch-wrap form presses of 200 ton capacity for Lockheed and Douglas, 50 tons larger than those built for Boeing-Wichita New machines will handle sheets measuring 24 ft. by 72 in. and extrusions within these limits**

► Air Transport Assn is polling members of its engineering committee to get airline technical comment on Aircraft Industries Assn's recent proposal to the Air Coordinating Committee for establishing a separate international cargo category and other views on ICAO transport airworthiness standards (AVIATION WEEK, Nov 14) Airline engineers are asked to evaluate the AIA proposal that a flat increase of 5 percent in gross weight be permitted for cargo planes over passenger planes This would amount to approximately 20 percent payload increase Results of poll will determine ATA position on the separate cargo category recommendation

► **KLM is proposing at the Dublin IATA conference, that a European factory be established to manufacture spare parts for American aircraft used by European companies**

AVIATION CALENDAR

Jan. 30-Feb 3—Winter general meeting, American Institute of Electrical Engineers, Hotel Statler, New York City.

Feb 9-10—Symposium, sponsored by the Eastern region of the Institute of Navigation, Department of Commerce auditorium, Washington, D C

Feb 18-26—National Sportsmen's Show, Grand Central Palace, New York, N Y

Feb 27 Mar 3—Spring meeting, American Society for Testing Materials, Hotel William Penn, Pittsburgh

Mar 1-2—Louisiana Aviation Conference, Washington-Youree Hotel Shreveport, La Harold J Bryant, Shreveport Chamber of Commerce, chairman.

Mar 6-8—Sixth annual Fourth Region non scheduled operators meeting and second annual Agricultural Aviation Conference, Hotel Texas, Fort Worth

Mar 6-9—47th annual meeting, American Road Builders' Assn , Netherlands Plaza Hotel, Cincinnati

Mar 6-9—Annual convention, Institute of Radio Engineers, Hotel Commodore, New York City

Mar. 24—Fifth annual flight propulsion meeting sponsored by the Institute of the Aeronautical Sciences, Carter Hotel, Cleveland

Mar 28-31—National Plastics Exposition, sponsored by Society of the Plastics Industry, Navy Pier, Chicago

Mar 30-31—Sixth annual helicopter forum, sponsored by the American Helicopter Society and the Institute of the Aeronautical Sciences, Ben Franklin Hotel, Philadelphia.

Apr 4-6—Engineering and Maintenance conference, Air Transport Assn., Hotel Continental, Kansas City.

Apr. 4-8—National Production Exposition, sponsored by the Chicago Technical Societies Council, Stevens Hotel, Chicago

Apr 16-20—Annual business meeting, American Assn of Airport Executives, Neil House Hotel, Columbus, Ohio

Apr 17-19—1950 aeronautic meeting, Society of Automotive Engineers, Hotel Statler, New York City

May 5-6—Midwestern conference on fluid dynamics and the national meeting of the American Physical Society, fluid dynamics division University of Illinois, Urbana

June 10-13—National Aeronautics Assn , annual convention, Hotel Statler, St. Louis, Mo

June 26-30—53rd annual meeting American Society for Testing Materials—ninth exhibit of testing apparatus and related equipment, Chalfonte Haddon Hall, Atlantic City, N J

PICTURE CREDITS

13—Wide World 14—Curtiss Wright Corp 18, 27, 28—McGraw-Hill World News 35—Link Aviation Inc , 39—FAA, 43—UAL

NEWS DIGEST

DOMESTIC

Adm Louis E Denfeld, one-time chief of Naval Operations, said he has requested retirement, after 40 years of service, effective Mar 1 At a press conference in Boston, the 58-year-old officer said he had never kept a diary—consequently has no plans for writing a book

Sen Edwin Johnson (D , Colo) plans to push vigorously ' his bill authorizing construction of another major commercial field to relieve congestion at Washington National Airport He indicated disapproval of proposals to move the military from Bolling Field and Anacostia Naval Air Station, which are across the Potomac River from Washington National Airport

Paul Mantz, Hollywood stunt flier and three-time winner of the Bendix Trophy, flew his red-nosed P 51 Mustang nonstop from Burbank, Calif , to LaGuardia Airport, N Y., in 4 hr 52 min 58 sec , apparently beating previous record set by Joe De Bona by 7 min 7 sec Mantz claimed better than a 500 mph average speed for the 2453 805-mi run Most of the flight was made above 35,000 ft With a northwest wind, Mantz averaged 580 mph between Chicago and New York

CAA has warned that pilots using antihistamine drugs in the treatment of colds should not operate an airplane unless they are certain the drug causes no side reactions in them, such as drowsiness and dizziness CAA's medical division recently cautioned against piloting while taking Dramamine, an antihistamine drug used as an airsickness remedy

Guy Whitaker, 63, head of the Guy Whitaker Co , died recently in Los Angeles after a brief illness His company, which operates as West Coast manufacturers' representative for a number of aircraft parts and equipment manufacturers, will continue in business

Personal aircraft exports of four-placers and under during December totaled 16, valued at $109,045, nine companies reported to the Aircraft Industries Assn Totals compare with 21 planes valued at $87,035 exported during the previous month Companies exported a total of 488 aircraft during 1949, valued at $2,207,361, compared with 994 planes valued at $3,598,803 during 1948 Reporting in the survey were Aeronca Beech, Bellanca, Cessna, Ercoupe, Piper, Ryan, Taylorcraft, and TEMCO

Unofficial lightplane altitude record for women was set at the Miami Air Maneuvers when Caro Bayley flew a Lycoming-powered Piper Super Cub 105 to 27,510 ft Official record of 26,138 ft was set last year by Mrs Martha Zimmerman of Reading, Pa , in a 1949 Cub

Boeing Airplane Co. and the Aero Mechanics Union (IAM) are prepared to resume contract negotiations, following action by the National Labor Relations Board in certifying the union as bargaining agent for production and factory workers at the Seattle plant Negotiations were broken off with a strike two years ago and since then the company has refused to bargain with the union, contending that under the Taft-Hartley Act the latter had lost its rights as collective bargaining agent with the company.

Sperry Gyroscope Co. received the largest peacetime order in its history from Army Ordnance for new and highly complex anti-aircraft fire control system New order, which tops a previous high for the company of $22 million for bombsight computers, will probably take two-three years to fill, bring about more employment and possible space expansion for the company

FINANCIAL

Waco Aircraft Co , Troy, Ohio, reported net loss of $148,341 for the fiscal year ended Sept 30, 1949, compared with a loss of $115,638 the preceding year Current assets totaled $253,733, current liabilities, $251,151 Previous year, current assets were $375,890, current liabilities, $19,015.

INTERNATIONAL

Air India International Ltd. has inaugurated Constellation service between Bombay, Aden and Nairobi, second long-distance international route of the carrier Flight time for the service, which will operate alternate weeks, is slightly over 14 hr

Britain's Air University will supply instructors to the Royal Pakistan Air Force Technical Training College, under terms of a five-year contract just concluded Total of 60 instructors will be employed in Pakistan on the project

IATA Clearing House hit an all-time peak of $16,387,000 in international air traffic transactions during November, 1949 Previous monthly high was reached in August, 1949, when accounts totaled $15,327,584 Total business from January through November was $150,000,000 compared with a turnover of $110,310,000 for the same eleven months of 1948

Vol 52, No 5 AVIATION WEEK Jan. 30, 1950

New Approach to Knotty Prototype Issue

Plan proposes $12-15 million program in which airlines would test transports.

By Alexander McSurely

A $12-to-$15 million program of flight test operation of new transport aircraft, operated by airlines under Air Force contract, is expected to be Air Coordinating Committee's recommendation to Congress as a means of government financing of new transport development.

A bill embodying the program was expected to be transmitted to the Bureau of the Budget last week as an alternative to the Department of Defense plans for outright purchase of transport prototypes. Principal sponsors are CAA, CAB and NACA.

▶**Military Proposal**—Meanwhile a military proposal for prototype financing was to be revealed today (Jan. 30) at a hearing of the Senate Interstate and Foreign Commerce Committee.

Major military emphasis is expected to be on two transport types:

• **Long haul transport** with payload up to 50,000 lb. and 2000 mi. range at 300-mph. block-to-block cruising speed.

• **Short-haul transport** with payload up to 14,000 lb. and 1000 mi. range at same speed.

Military Air Transport Service engineers who have been conducting most of the evaluation of transport types and their utility for the Department of Defense have indicated they consider these two types of more immediate urgency for military use than a turbojet-powered passenger transport such as the 40 passenger 500 mph. plane with 2400-mi. range suggested by the ACC's prototype evaluation group last March. Neither has the military shown much interest in the smaller feederliner transport prototype or the seaplane transport which completed the five types proposed for development.

▶**Johnson View**—Sen. Edwin Johnson (D., Colo.), chairman of the Interstate and Foreign Commerce Committee told AVIATION WEEK that he wants to learn more about the prototype program before he takes a position, and that he sees a question whether "we can work out a type of plane serving everybody's interest." He does not feel that the British have yet proved their jet transports practical, but he does not think we can afford to wait and see how their developments come along.

We are behind as far as passenger ships are concerned but our military has been very energetic. No one knows more about jet planes than we know," he added.

▶**Defense Requirements**—Presentation of the military proposal on transport prototypes was expected as a part of a discussion of basic military requirements for commercial aviation for national defense. One unofficial report was that the Department of Defense has plans to take over 25 percent of all commercial transports immediately in an emergency, including all four-engine planes.

Planning on the flight test operation proposal takes in a wide range of utilization of the year's testing program by the civil agencies and the airlines for such things as:

• Pilot training.

• Compiling economic data on operations.

• Studying operation of high speed transports in turbulence.

• Study control and ground handling.

• Compiling air safety operational data.

▶**Combined Program**—Proponents of the testing program point out that most of these problems would have to be handled by the civil agencies and the airlines in any case and that it would be most economical to combine them into a single program.

A preliminary "run" on such a program could be made with a present-day basic transport model such as the DC-6 or Convair 240 converted to turboprop powerplants, advocates say. This would enable the Air Force as contracting agency, the airlines as contractors and the civil agencies participating in various phases of the tests, to get experience in the testing and would enable the manufacturer to get into a program without the overall expense of designing and building a completely new prototype for the purpose.

▶**Four Tests**—It is believed that two such turboprop plane programs plus a similar testing program on a turbojet passenger transport, and a preliminary proposed program of operating some North American four-jet B-45 light bombers in simulated passenger transport operation, could all be accomplished for the $12-to-$15 million expenditure.

These expenditures would cover the cost of the operating contract, including all basic modifications to the airplanes (three planes to be used in each test program) as long as the modifications were required by operational or safety considerations and were not routine maintenance.

▶**Modification Cost**—Expense of bringing a prototype transport from first flight stage to acceptance into regular passenger service is a major item in its total cost. Boeing calculated that modifications on its Stratocruiser transport amounted to $3.6 million. Douglas quoted a much smaller figure of $680,000 for modifications on the DC-6, but the two figures are not exactly comparable because of different auditing practices.

Flying B-45s in simulated transport runs has been under discussion for some months. Originally the USAF was asked to detach six of the bombers for this purpose. It is understood that there are USAF objections on two grounds:

• **The number of planes** that would be detached from regular training and operations.

• **The basis of the program** would be to provide operational information about the planes, and that releasing this information would in some cases "breach" security regulations about the B-45.

▶**Prompt Starting**—It is understood that the testing program if it should get Budget Bureau and congressional approval would seek funds out of fiscal 1951 and 1952 budgets for prompt starting of the project.

Advocates of the plan consider it a way to get around the problem of cost recovery which Congress seems to feel is inherent in direct subsidization of transport prototypes. It is believed that some form of cost-recovery clause will be sought in almost any bill directly buying prototype transports, which would provide that the cost be repaid by the manufacturer out of future sales of production airplanes or by some other means.

▶**Aid Expected**—While it is too early to

appraise the chances of either military or ACC proposals in Congress specifically, it is believed that some form of government aid to transport aircraft builders, to enable them to get off "dead center" and resume prototype transport development will be voted in the current Congress session

It is also probable that whatever form such aid takes that it will be turned over to the Air Force to administer, because the Air Force already has an operating procurement setup for aircraft, but that it will be definitely understood that the funds will be entirely separate from the USAF military procurement budget, and that money from neither can be switched to the other

New Bellanca Is Faster, Heavier

Cruisemaster flies at 180 mph., stalls at 43.6 mph.; price of improved four-placer is $9500.

Bellanca Aircraft Corp.'s new personal and executive four-place plane, the Cruisemaster got its price tag last week. Designed for the highest cruising speed of any current production plane in its class—180 mph at 6000 ft at 75 percent power—the craft is listed at $9500. Low stalling speed of 43.6 mph is retained, despite the high cruising speed.

Most obvious change in the airplane from its predecessor, the four place Bellanca Cruisair Sr., is in powerplants. The Cruisemaster has a 190 hp Lycoming O-435-A engine, which turns a Hartzell 78 in. diameter hydro selective controllable propeller. Earlier plane used a 150 hp Franklin engine with various propellers. This version was priced at $6950.

New craft will carry four persons plus 198 lb. of baggage with full 40 gal. fuel load, and has a maximum range of 680 mi. Fuselage and wing closely resemble those of the Cruisair Sr. Wingspan remains 34 ft. 2 in. but fuselage is 2 ft. longer (23 ft.), presumably because of larger engine. Plane height of 6 ft. 2¼ in. is unchanged.

Weight empty is 1525 lb., increased from 1255 lb. empty for the Cruisair Sr., gross weight is now 2600 lb., compared to 2150, allowing a useful load of 1075 lb. for the new plane as compared to 895 for the earlier model.

Part of the additional weight empty and the higher price is due to more complete instrumentation and radio now supplied as standard equipment. Included are:

- **Flight instruments.** Kollsman or Pioneer airspeed indicator, sensitive altimeter, and rate of climb indicator, Kollsman or Schwien turn and bank indicator, Airpath compass, Elgin sweep-second clock.
- **Engine instruments.** Stewart Warner tachometer, fuel gauges and ammeter, Kollsman or Pioneer manifold pressure gauge, U. S. Instruments 3-in-one engine gauge (includes oil and fuel pressure and oil temperature) and Lewis cylinder head temperature gauge.
- **Radio.** Avigator model AT-99-45 BL/VHF transmitter and receiver plus standard receiver, 75 mc. marker beacon receiver, rotatable loop, speaker, earphones and microphone.
- **Lighting.** Two GE landing lights in wing, Grimes position and tail lights, cabin dome and instrument panel lights.

Other features of the Cruisemaster include: Hydraulic retractable main landing gear with steerable tailwheel, oleo struts, 6.00 × 6 nylon tires with Goodrich hydraulic brakes, leather-upholstered airfoam seats, exterior colors of Tennessee red, cobalt blue, and yellow, cabin heating and ventilating system, and soundproofing.

Optional is an extra 25 gal. auxiliary fuel tank, which can be installed in the baggage compartment, for additional range.

Cruisemaster has a wing loading at gross weight of 16.09 lb./sq. ft. and a power loading at gross weight of 13.68 lb./sq. ft. Wing area is 161.5 sq. ft.

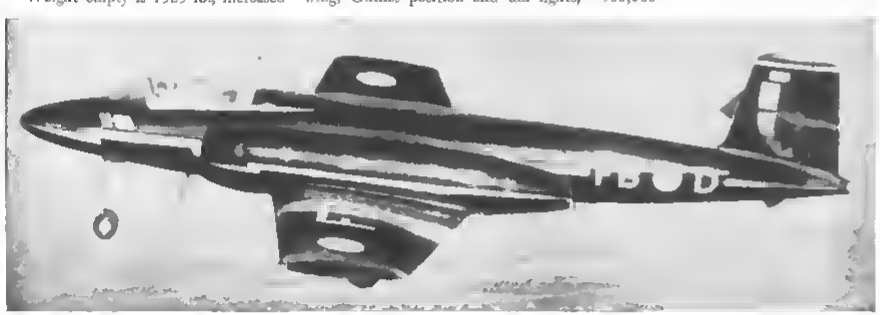
Price is on the basis of flyaway delivery from the Bellanca plant at New Castle, Del.

Would Add 5 Years For CAA Airport Plan

Legislation extending Civil Aeronautics Administration's slow moving airport development program over another five years has been introduced by Sen. Pat McCarran (D., Nev.).

The 1946 act, sponsored by McCarran, contemplated a $1-billion seven-year program and authorized a total federal appropriation of $500 million, half the cost. It set 1953 as the expiration date. McCarran's bill would move this up to 1958.

Since only $95 million has been appropriated to date for airport construction, a sizeable slice of the $500 million already authorized will expire before it can be used, unless the extension is enacted. The 1947 fiscal year airport appropriation was $45,000,000, in 1948 fiscal, $32,500,000, the 1949 fiscal, $3,000,000, and the 1950 fiscal, $14,500,000.

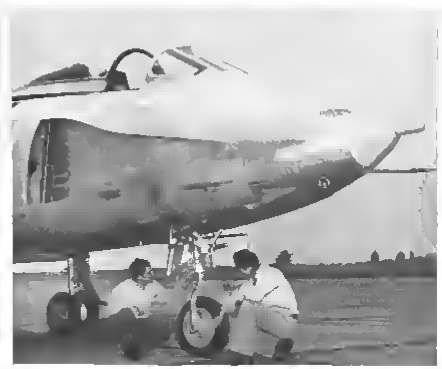


FIRST FLIGHT FOR CF-100

Royal Canadian Air Force's first-line twin-jet long-range fighter, the Avro CF-100, took to the air for the first time last week, remaining aloft 20 min. W. A. Waterton was at the controls of the craft, which reportedly behaved well. Powered by two Rolls-Royce Avon engines, later to be replaced by Avro Canada Orendas, the CF-100 is 52.5 ft. long, has a wingspan of 52 ft., and height from top of cabin to ground of 10 ft. 7 in. Weight of the new twin-jet fighter is 16 tons.

SLEEK PROFILE of new YF-93A long-range fighter indicates spectacular performance, added boost which will be attained by using .

AFTERBURNER with flush ducts, apparently for cooling, and



FLUSH INLETS of huge capacity for P&W centrifugal flow jet.

YF-93A Makes First Flight

Newest addition to the USAF jet penetration fighter stable, the swept wing North American YF-93A flew for the first time last week at Edwards AFB, Muroc, Calif., and immediately became a strong contender for quantity USAF procurement although currently only two of the planes have been ordered.

The powerful new craft made a JATO takeoff and flew for 43 min. on its first trip aloft.

The 10 ton fighter, nearly twice as heavy as its earlier relative, the 13,000-lb. North American F-86, is powered with a new Pratt & Whitney J-48 turbo-Wasp engine, American development of the British Tay design, rated at 6250 thrust lb. dry, and about 8000 lb. with afterburner.

Comparison of dimensions with those of the F-86 shows clearly that the new long-range fighter is a much larger airplane. Wingspan is 39 ft. as compared to 37 for the F-86, fuselage length is 44 ft. as compared to 37 ft., while height is 16 ft. as compared to 14 ft.

Twin flush air intake ducts just above and forward of the wingroots are precisely tailored into the sides of the fuselage, leaving the nose clear to house interceptor radar. (The F-86 has a single intake duct in the center of the nose.)

Exceptionally large boundary layer bleeds are visible at the intake ducts. Smaller flush air intake ducts near the tail apparently serve as a cooling arrangement.

Single wheel nosegear retracts forward into the nose, while small diameter twin wheeled main gear retracts inboard into the wingroots.

Automatic wing slots and slotted type flaps are provided.

Fuselage diameter appears considerably greater than that of the F-86, presumably to enclose the larger diameter of the centrifugal-flow type J-48 which replaces the slimmer axial flow type GE J-47.

Tail surfaces are swept back like those of the F-86, and are slightly larger, in keeping with the general scaling up of the YF-93A.

As a more powerful development of the first tactical combat plane to fly faster than the speed of sound (AVIATION WEEK, June 14, 1948), the YF-93A is described by USAF as "designed to reach high sub-sonic speed," an apparent understatement of the new plane's obvious real capabilities, when its reduced drag and greater power is considered.

The F-86 is currently the Air Force's top standard jet fighter with approximately 800 planes on order or delivered. The plane still holds the world's speed record of 670.98 mph. But North American announced recently that new production F-86s are exceeding this official record almost daily in acceptance tests at Los Angeles.

CW-40 LATEST ENTRY in USAF Arctic rescue helicopter competition, a new field for Curtiss-Wright Corp

CW-40 Arctic Rescue Copter

Basic Data

Main Rotor	
Diameter	48 ft
Blade area (Total for 4)	73.6 sq ft
Rotor rpm (Cruising at 3000 engine rpm)	200
(Takeoff at 3370 engine rpm)	225
Takeoff power loading	12.9 lb/hp
Rotor disk loading	2.39 lb/sq ft
Incidence angle (Maximum)	24 deg
(Minimum)	minus 6 deg
Tail Rotor	
Diameter	10 ft
Blade area (Total for 3)	6.1 sq ft
Incidence angle	minus 4 to 17 deg
Weights	
Design gross	4333 lb
Empty (equipped with flight instruments and crew accommodations but without passengers or cargo accommodations)	1975 lb
Useful load (includes passenger or cargo accommodations)	2358 lb
Performance	
Hovering ceiling out of ground effect	12,000 ft
Hovering ceiling in ground effect	15,000 ft
High speed, sea level, 350 hp	110 mph
High speed, 12,000 ft, 260 hp	93 mph
Operating speed, sea level, 250 hp	90 mph
Operating speed, 12,000 ft 233 hp	85 mph

C-W Enters AF Helicopter Bid

Acquires license rights to use Doman Helicopter Inc.'s rotor system and "Pelican" design for prototype.

Curtiss Wright Corp has submitted a design in the Air Force competition for an Arctic rescue helicopter. An amphibian rotary wing configuration, it is designated Model CW-40 and also is being pushed for commercial application. It marks the initial venture of Curtiss-Wright in the helicopter field.

First public mention of the commercial version is expected to be made next week in New York at the CAB hearing on the New York area helicopter case.

►**Doman Rotor Used**—The CW-40 will incorporate the Doman dynamically balanced rotor system (AVIATION WEEK, Jan 26, 1948) under a licensing arrangement. The prototype machine is slated to be a modification of Doman Helicopter Inc.'s "Pelican," the LZ-2, and will be powered by a single Lycoming (SO 580) 350 hp supercharged engine with takeoff rating at 400 hp. The second craft probably will be a twin-engine configuration.

Use of the Doman rotor system in the CW 40 should afford those characteristics which Doman helicopters have successfully demonstrated—unusual stability in hands-off flight, light rotor weight, long fatigue life, among others.

►**Price Estimate**—Price of the CW-40 is likely to be a strong point in the company's production and marketing plans. It is estimated that in quantities of about 12, the price for a commercial version will be approximately $100,000, with the engine included.

On this basis, the price of the Arctic rescue version should be in the neighborhood of $80,000 without government furnished equipment.

►**Accommodations**—The design provides for six litters or, in an alternate arrangement, for eight passengers in addition to pilot and copilot. In the litter version, a hoist arm would be swung from the main cabin and be manned by a single attendant (copilot). The litter would be hoisted parallel with the fuselage until the floats are cleared, then would be free to swing for directing into cabin area.

Main cabin section, exclusive of the control area, measures 7 ft 4 in. long by 6 ft. wide by almost 5 ft. wide. It is fitted with a quick-change panel, which can be opened in hovering flight, to expose one entire side.

Front wheels of the landing gear are castered, while rear wheels are equipped with brakes. A metal box beam keel attached to the landing gear is covered with a rubberized nylon cord air inflated float.

►**Floor Support**—Engine is located below the cockpit floor and shock mounted at four points to a tubular, welded steel frame. The enclosed drive shaft, from engine to gearbox below the rotor head, angles up through the top forward center portion of the main cabin.

Floor structure, a major fuselage component, is made up of welded-steel tubes comprising side trusses, bottom cross members and diagonals. A cellular cabin floor closing the upper part of the floor beam incorporates flat and corrugated sheet. Fittings on the forward portion of the floor beam support the engine mount and forward wheel struts. At the rear of the elevated cockpit floor is a laterally extending upright truss welded to the floor beam, carrying vertical flight and landing loads transmitted between forward end of floor and roof beams.

Fuel and oil tanks and storage battery are carried within the forward portion of the floor beam.

►**Heating**—Both a manifold shroud and combustion type heater will be utilized. To provide for engine preheating, the output of the combustion heater will be able to be directed to the engine section.

A takeoff duct will preheat the mechanisms of the rotor and reduction gear.

determined, TWA took the Felix Roma controversy to the U. S. District Court in New York and asked an injunction against the charter flights. Action on the injunction was withheld pending CAB's reconsideration.

In its December opinion, CAB approved the PAA-Felix Roma off-season charters on condition that the flights be devoted to limited group air travel and not result in higher mail pay subsidies. The Board also reserved the right to withdraw its approval should the carriage later appear not to constitute limited group travel or should the class of traffic represent a substantial diversion from regular first class air services.

►**New Facts**—CAB says additional facts now available impel the conclusion that the proposed Felix Roma operations would be conducted at a loss to Pan American, thereby increasing that carrier's need for government support. The Board added that new information showed the proposed Felix Roma traffic could not be regarded as travel designed only for limited groups (since over 25 million U. S. Catholics apparently were eligible to take advantage of the reduced rate trips).

Both camps were quick to issue statements on the heels of the CAB action. A Pan American spokesman said: "We regret that the Board's decision will prevent Felix Roma from carrying out its plans for low cost air pilgrimages. The Board does not deny the broad popular demand for low fare coach type air service to Europe. Pan American intends to continue its advocacy of (such service) available to everybody."

Warren Lee Pierson, chairman of the board of TWA, said by trans-Atlantic telephone from Paris: "I am happy to learn that the Civil Aeronautics Board has acted to preserve the integrity of international routes under the American flag three-carrier system as approved by President Truman in 1945."

CAB Now Bans PAA-Felix Roma Deal

Executing a neat flip-flop, the Civil Aeronautics Board has reversed its opinion of last December and denied Pan American Airways' application to conduct Holy Year charter trips to Rome under agreement with Felix Roma, an Italian travel organization.

The Board's latest action was in two parts. Besides withdrawing previous conditional approval for eight PAA Felix Roma roundtrips monthly during the off season, CAB refused to permit Pan American to conduct one roundtrip daily to Rome during the peak summer period between June 1 and Sept. 30.

►**Court Fight**—TWA won a notable victory in the Board's reversal. Only U. S. flag line certificated to Rome, TWA had claimed that the PAA exemption for Felix Roma flights was illegal and abetted Pan American's chosen instrument ambitions.

Seeing the value of its certificate im-

Justice Withdraws

The U. S. Department of Justice back-tracked last week from its previous stand in the American Overseas Airlines-Pan American Airways merger case. It withdrew all but one of the more than 40 exceptions it had made to the report by Civil Aeronautics Board Examiner Tom Wrenn, in which he recommended approval of the merger.

No explanation was offered for the withdrawal which left standing only the department's strong protest against the possibility of monopoly if Wrenn's recommendations are adopted (AVIATION WEEK, Jan. 16).

Previously, the department had questioned the propriety of Wrenn's sitting in on the case because he was also examiner in the original North Atlantic route proceeding—decided in 1945—and at that time recommended against certification of TWA which now opposes the merger. The department, whose representatives put in little more than token appearance at the long hearings in the case last year, also had assailed what appears to be bias and prejudice on the part of the examiner in favor of the applicants (Pan American and American Airlines)' and had said Wrenn's report was "replete with instances of careless treatment of issues vital to the public interest and established national policies."

AEROBATICS CHAMPIONS Rodney Jocelyn (right) took first prize in the Gulf Oil National Aerobatic Contest at the recent Miami Air Maneuvers, outpolling six-time winner Bevo Howard (left), who took second. Third prize went to Betty Skelton (center) who competed with the men for the first time this year. Jocelyn, from Langhorne, Pa., is a relative newcomer to aerobatic flying. He won $1750.

Trouble Brewing on 70-Group Cut

House committee set to charge Administration acts unconstitutionally in withholding appropriated funds.

A new congressional blast at the Truman Administration on the 70 group Air Force issue is building up for early explosion

AVIATION WEEK is reliably informed that the House Armed Services Committee in a forthcoming report will accuse the Administration of usurping the constitutional power of Congress to "provide for the common defense," because of the recent presidential impounding of military funds Congress has appropriated Report is prepared to cover the broad issues of national defense developed in the course of last fall's committee hearings on the B-36 bomber

One indication of congressional feeling already has come from last week's release of first reports on 1951 military budget hearings before a House appropriations subcommittee, where a similar accusation was voiced

Key to the blast is President's deft political maneuver which impounded $851 million which Congress had appropriated to implement the next step in a 70-group Air Force for the current fiscal year Truman and Defense Secretary Johnson had contended that a 48-group Air Force was sufficient and had refused to spend the additional funds Congress made available Naval appropriations also were withheld

▶ **Denfeld Ouster Hit**—The report will also strongly repudiate the ouster of Adm Louis Denfeld as chief of Naval Operations as reprisal for his free testimony under oath during the B-36 hearings, AVIATION WEEK's sources said Secretary of Defense Louis Johnson publicly assured that there would be no reprisals for Naval testimony critical of his department policies

The 70-group USAF and Denfeld matters raise these two far reaching issues to be dealt with in the report

- Is the Administration or the Congress to determine the country's defense strength? The net result of the withholding of funds this year is that the determination was by the Administration, not the Congress
- Are high ranking officers and the three department secretaries to be permitted to testify freely before congressional committees? Or is the threat of reprisal to hang over their heads for expressing honest views critical of over-all department policies?

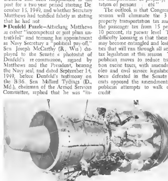
▶ **Matthews' View**—In testimony before the Senate Armed Services Committee, Secretary of Navy Francis Matthews answered the question in this ambiguous way Officers and officials have a public responsibility to testify fully to congressional committees But if they express views, either to Congress or elsewhere, in conflict with accepted policy, they should be removed from "the chain of command." He emphasized the difficulty of administering a department with obstructionists in the line of command

Chairman Carl Vinson (D, Ga) of the House Armed Services Committee has anticipated that the group's report will be "unanimous" Rep James Van Zandt (R, Pa.), who touched off the B 36 investigation with a speech on the House floor, told AVIATION WEEK, "I think it will be And I think it will have plenty of guts, too"

Meanwhile, the nomination of Adm Forrest P Sherman as chief of Naval Operations was approved after a technical tangle in the Senate over whether Denfeld had been reappointed to the post for a two year period starting December 15, 1949, and whether Secretary Matthews had testified falsely in stating that he had not

▶ **Denfeld Puzzle**—Attacking Matthews as either "incompetent or just plain untruthful" and terming his appointment as Navy Secretary a "political pay-off," Sen Joseph McCarthy (R, Wis) displayed to the Senate a photostat of Denfeld's re-commission, signed by Matthews and the President, bearing the Navy seal, and dated September 14, 1949, before Denfeld's testimony on the B-36 Sen Millard Tydings (D., Md), chairman of the Armed Services Committee, replied that he was "inclined to believe" that the President could remove a top officer even after he was commissioned for a new term Tydings contended that Matthews was "basically" right since Denfeld was never actually sworn in for a new term as CNO and was "not fully clothed by the office." Denfeld subsequently replied "My understanding and the understanding of everybody else was that I didn't have to be sworn in again"

Sherman's approval came in a Senate voice vote Tuesday



CLOSE LOOK AT AVON TURBOJET

Rolls-Royce Avon turbojet, shown here in first close-up, has been officially rated at 6000 lb thrust at sea level, although the engine has frequently been reported to develop 7500 lb. thrust Photo shows that Avon has eight combustion chambers and is an axial-compressor type. Avon made its initial flight test in the two outer nacelles of a converted Lancastrian transport, and its first regular installation was in the Canberra bomber. Avro Canada's CF-100 is currently powered by two Avons.

Transportation Tax Reduction Likely

Growing move in Congress to reduce or eliminate transportation taxes got lukewarm approval last week from the President

He recommended "that excise taxes be reduced to the extent, and only to the extent, that the resulting loss in revenue is replaced by revenue obtained from closing loopholes in the present tax laws" He added "Reductions are most urgently needed in the excise taxes on transportation of property, transportation of persons ... etc"

The outlook is that Congress at this session will eliminate the 3 percent property transportation tax and reduce the passenger tax from 15 percent to 10 percent, its prewar level The only difficulty looming is that these changes may become entangled and lost in politics that will run through all actions on tax legislation at this session Two Republican moves to reduce transportation excise taxes, with amendments to oleo and civil service legislation, have been defeated in the Senate Democrats opposed the amendments as Republican attempts to walk off with credit

USAF, Navy Bid Information

Air Materiel Command Procurement Division makes available to AVIATION WEEK the latest bid awards, shown on this page Requests for further information should be addressed to Contracting Officer, AMC, Wright Patterson AFB, Dayton, Ohio, attention MCPPSX72

ABSTRACTS

For 1000 stand assemblies (00-392)
Marine Aircraft Corp, Fort Worth, on a bid of $84 020

For 35 propeller posts and stand assemblies (00-048)
Companies sharing Geco Inc., New Canaan Conn. on a bid of $450 and Bunell Machine & Tool Co., Cleveland on a bid of $5550

For 298,500 clips (00-417)
Companies sharing Thomas Associates Los Angeles on a bid of $5500 and Collord Inc. Detroit, on a bid of $2362

For bolt assemblies (00-420)
Companies sharing Pittsburgh Screw & Bolt Corp Pittsburgh, on a bid of $5223 40, Detroit Bolt & Nut Co Affiliate Wayne Steel & Supply Corp Detroit, on a bid of $132443 Michigan Bolt & Nut Co Inc, Detroit, on a bid of $9011 05, and Pac-Pacific Screw & Bolt Co. Richmond, Calif., on a bid of $877 00

For race and ball assemblies (50-440):
Barden Corp Danbury, Conn., on a bid of $12 084

For 96 photographic supplies (00-408)
Companies sharing Bell & Howell Co. Chicago on a bid of $2600 00, Graflex Inc., Rochester, on a bid of $60, Eastman Kodak Co. Rochester on a bid of $8742 10, and Peko Corp, Minneapolis, on a bid of $2750 28

For photographic equipment (00-107):
Companies sharing David Linzer & Sons, Inc. New York, on a bid of $176 Malone Camera Stores, Inc. Dayton, on a bid of $3889 Conway Camera Co, Chicago on a bid of $6010, Norman Willets Co Chicago on a bid of $17 272 Williams Brown & Earle Inc., Philadelphia, on a bid of $705 75 Graflex Inc., Rochester on a bid of $855 Bert L. Daily, Inc, Dayton on a bid of $470 Arel Inc, St. Louis on a bid of $470 Kinnalite Optical Co Inc. Peekskill, N Y on a bid of $1803 50 Joseph E. Frankle Co Philadelphia, on a bid of $1817 and Stephenson Film Corp., New York on a bid of $224

For seamless tubing (00-391):
Companies sharing Tube Distributors Co., Inc. Brooklyn on a bid of $27,387 94, Summerill Tubing Co, Pittsburgh on a bid of $22,311 77, and Ellwood Ivins Steel Tube Works, Inc. Oak Lane, Philadelphia, on a bid of $769 44

For portable airborne cooler (50-312):
U S Thermo Control Co, Minneapolis, on a bid of $431 321.10

For aircraft generators (00-300):
Jack & Heintz Precision Industries, Inc., Cleveland on a bid of $22 233 44

For steel—angle and plate structural (00-374)
Companies sharing Jos. T Ryerson & Son Inc. Cincinnati, on a bid of $3532 50, Baron Steel Co., Toledo on a bid of $21,-414 40, and Carnegie Illinois Steel Corp, Cincinnati on a bid of $3891 27

For 83 000 rolls tape (00-417)
Van Cleef Bros, Inc. Chicago on a bid of $5000

For 1020 hose assemblies (00-481)
Aeroquip Corp Jackson, Mich. on a bid of $14 444 15

For photographic chemicals (00-068)
Companies sharing National Chemical Co. of Los Angeles Los Angeles, on a bid of $875 80, Ansco Div General Aniline & Film Corp Binghamton on a bid of $15-137 50 Octagon Process Inc., Brooklyn on a bid of $18 298 82 and Fairmount Chemical Co, Inc., New York, on a bid of $3082 50

For wolf strip fur (00-402):
Alaska Fur Co Seattle, on a bid of $9400 50

For printer, data and spare parts (40-1010)
Polan Industries Huntington, W Va., on a bid of $126 421 32

For elbow, flared tube (50 308)
Companies sharing The Aircraft Fitting Co. Cleveland on a bid of $3340 00, V L. Graf & Company, New Baltimore Md., on a bid of $5788 00, The Weatherhead Co., Cleveland on a bid of $1350 00 Irvin W Masters Inc Burbank on a bid of $8162 50, Pacific Piston Ring Co Los Angeles, on a bid of $2009 00 The Parker Appliance Company Cleveland on a bid of $3432 50, and The Deutsch Co. Los Angeles on a bid of $11 772 00

For fertilizer (00-380)
Companies sharing Best Fertilizer Co. Oakland on a bid of $12,000 00 Summers Fertilizer Co., Inc., Baltimore, on a bid of $104 844 80, Barrett Division Allied Chemical & Dye Corp., New York, on a bid of $47 585 00 Hercules Powder Co. Wilmington on a bid of $1350 00, Wilson & Toomer Fertilizer Co, Jacksonville on a bid of $30 100 00 American Agricultural Chemical Co New York on a bid of $29 485 20, and Sewerage Commission of the City of Milwaukee, on a bid of $11,777.50

For nuts etc., (50 387)
Companies sharing Clary Multiplier Corp Los Angeles on a bid of $2771 15 Elastic Stop Nut Corp., of America Union N J on a bid of $13 840 28 and Air Associates Inc., Teterboro, on a bid of $5445 00

For 232 each relay test set (00-300):
Phaostron Co., South Pasadena on a bid of $27,314 00

For can, container case, cement (00-072):
Companies sharing Compco Corp Chicago, on a bid of $2300 00 Neumade Products Corp New York on a bid of $3477 70 and Eastman Kodak Co, Rochester on a bid of $336 00 and Fiberbilt Sample Co, Inc. New York on a bid of $4580 50

For chair-drafting; steel etc. (50 253):
Companies sharing Chas G Stott & Co, Inc., Washington D C, on a bid of $108-513 46 The Roth Office Equipment Co., Dayton, on a bid of $88,590 00, Everybody's Office Outfitters Inc, Dayton on a bid of $211 835 83 and Seitz & George Office Equipment Co. Dayton on a bid of $2829.90

For modeling base (00 080)
Companies sharing Northwestern Tool and Engineering Co Dayton on a bid of $4870 00 and Karp Metal Products Co, Inc., Brooklyn on a bid of $4200 00

For steel wire (00-380):
Worcester Wire Works division of National-Standard Co. Worcester, on a bid of $21 016 22

For stapler; pencil, paint and brush (00-407):
Companies sharing Kosmin's Camera Exchange Philadelphia, on a bid of $1249 00; Arthur Brown & Bro. Inc. New York, on a bid of $75.00 Specialty Assembling & Packing Co. Inc Brooklyn, on a bid of $1200 50 and Joseph E Frankle Co., Philadelphia on a bid of $50 00

For stand assembly aircraft maintenance, maint. data (00 414)
Aeronca Aircraft Corporation, Middletown O, on a bid of $24,377 63

For stand assembly (00-418):
Aeronca Aircraft Corp, Middletown, Ohio, on a bid of $136,772 00

For steel welding electrode, steel, welding rod (00-418)
Companies sharing Harnischfeger Corp Milwaukee on a bid of $382.50 Hollup Corp division of National Cylinder Gas Co Chicago, on a bid of $484 00 and The McKay Co, Pittsburgh on a bid of $4279 50

For screws (50-451)
Reed & Prince Mfg Co., Worcester, on a bid of $5140 47

For screw; brazier head steel (00-487):
Reed & Prince Mfg Co Worcester on a bid of $4331 42

For plug engine cylinder dehydrator (00-469)
Clark Metal Products Inc. Fairfield, Conn., on a bid of $30 254 00

For screws, (00-464)
Reed & Prince Mfg Co, Worcester on a bid of $2634 31

For roller bearing, tapered, cone and roller assy. (50-467):
The Timken Roller Bearing Co., Canton, O on a bid of $3374 00

For can, reel, (00-402)
Compco Corporation Chicago, on a bid of $148 055.00

For trailer assy fuel dewmeter, etc., (00-000)
Bendix Aviation Corp Eclipse-Pioneer Div Teterboro on a bid of $9327 60

AF Invitations to Bid

Bids openings are 20 30 days after approximate issue dates shown in the following bid proposals Bid sets containing specifications for items to be procured will be sent to qualified applicants who state bid invitation number

One bid set will be available for examination without obligation by prospective bidders, after bid publication date, at each of the seven AMC procurement field offices This will enable firms to see specifications before writing or telegraphing for their own bid sets

Procurement field office locations Boston Army Base, Boston 10, Mass, Government Aircraft Plant No 4, Ft Worth 1, Tex, 39 S LaSalle St, Chicago 3 Wright Patterson AFB Dayton, Ohio, West Warren and Longo Aves., Detroit 32, 155 W Washington Blvd, Los Angeles 67 Broad St., N Y 4

INVITATIONS

Dome, navigator's observing, 463 each bid invitation No 50-726 issue date 20 Jan delivery by July 1950

Reel RL 40, 12 each bid invitation No. 50-751 issue date 23 Jan. delivery within 90 days

Navy Bid Invitations

The following bid invitations have been selected from those announced by the Navy Dept Aviation Supply Office at Philadelphia Bid forms may be obtained from the Aviation Supply Office, Oxford Ave, and Martin's Mill Road, Philadelphia 11 Specifications are not furnished unless requested by number

Screws, cap and set, 17 items spec. MIL-S-032, invitation no. 10,231 bids due, Feb 14

Power panels 85 ea., Cole Electric Products Co E 216, invitation no. 10 242, bids due Feb 8

Relays, 3 items single-pole, double-throw, Philco Corp. parts nos; invitation no. 10,-244 bids due Feb 7

Fabric items 40 yd aircraft carpet, 42-in. wide, ¼-in thick, 100 yd. gabardine wool gray 54-in wide; 200 yd flameproof gabardine blue, 54-in. wide, Collins, invitation no 10 245 bids due Feb. 6

Resistors. 19 items. including 2 items ferrule type wire bound spec. JAN-R-26A invitation no. 10,260 bids due Feb. 7

Anti-friction bearings 65 ea. special needle bearing Smith Bearing division invitation no 10 272 bids due Feb 7

Microammeters 200 ea. rectifier type, 4 stude, 0-235 microamps Weston invitation no 10,278, bids due Feb 9

IAS Meeting Studies New Science

Aeroelasticity for first time considered as separate subject; 45 technical papers presented at sessions.

Continuing progress and latest research trends in many categories of aviation were disclosed in the broad coverage given in technical papers at the 18th annual meeting of the Institute of the Aeronautical Sciences in New York. More than 1000 registrants assembled for the four-day sessions beginning Jan. 23.

Indication was that "aeroelasticity," a comparatively new science combining factors of aerodynamics and structures into a single study, generally has come to be recognized as a field of its own. For the first time this designation was included among the usual section headings, such as "rotating wing aircraft," "instruments," etc. Four extensive papers were presented on aeroelastic problems.

Most time allocated to any of the categories discussed at the meeting was given to aerodynamics—indicating that this subject still continues to hold top priority on the interest of aeronautical engineers. And there was evidence that in the past year a tremendous amount of research has been conducted in the field of high-speed flows. Practically all of the 12 papers presented at the three-part aerodynamic session dealt with supersonic and hypersonic phases.

Safety was the keynote of most papers presented at the air transport session, which was conducted in cooperation with Flight Safety Foundation. Observers took this to indicate an increasing interest in this prime operational consideration.

Discussion of powerplant factors was limited to a symposium on jet installation design problems in which the airplane designer's viewpoint was balanced against viewpoints offered by representatives of five major engine manufacturers.

Following are summaries of some of the 45 papers presented during the three-day session. Remainder of the papers will be summarized in the next issue of AVIATION WEEK.

ROTATING WING AIRCRAFT

Practical Instrument Flying of Helicopters—Owen Q. Nichaus and Joseph A. Cannon, Bell Aircraft Corp.

Development of the helicopter has now approached the point where, to realize its full potential, it appears desirable to prove its capability of being safely flown by sole reference to blind flying instruments for protracted periods of time.

A discussion of problems is given, as well as a possible interim solution. This involves the restricted use of currently available flight instruments by limiting the minimum flight airspeed to an arbitrary 40 mph. An explanation of stability and controllability as applied to the helicopter follows and their effects on pilot fatigue discussed.

The instrument flight program involving a Bell 47D is revealed and a study made of instrument placement, relative importance of various instruments, and other physiological aspects. The need for specialized instrumentation for accurate representation to the pilot of the novel flight characteristics of rotary winged craft is acknowledged and suggestions for their conception and development are pointed out.

A Type of Lifting Rotor With Inherent Stability—Kurt Hohenemser, Chief of Aerodynamics Helicopter division, McDonnell Aircraft Corp.

The more important of the forward flight aerodynamic characteristics of a rotor type are presented, where the collective blade pitch angle is kinematically coupled with the collective flapping or coning angle while no coupling is provided between cyclic flapping and cyclic pitch angles.

The rotor with pitch-cone change may be designed to have positive static stability as compared to the negative static stability of the conventional fixed-pitch rotor; partial blade stall during pull-ups or upward gusts may be avoided in spite of a high and economic thrust coefficient in steady flight and no adjustment of the collective pitch control is required for the transition from powered flight to autorotation. The rotor with pitch-cone change because of its inherent stability promises without recourse to external stabilizing devices appreciably improved flying qualities of the helicopter.

An Explanation of Some Important Stability Parameters that Influence Helicopter Flying Qualities—Alfred Gessow and Kenneth B. Amer, Aeronautical Research Scientists, Langley Aeronautical Laboratory, NACA.

To provide those engineers interested in rotating wing aircraft (but having no special training in stability theory) with some understanding of the stability and control parameters that influence the flying qualities of the helicopter an explanation is made of those parameters which are the most important to the pilot.

Three significant factors—static stability with angle of attack, static stability with speed, and control sensitivity—are detailed. The explanation is made in terms of fundamental physical quantities.

Design and Operational Features of the Sikorsky 1000-h.p. Helicopter Rotor Test Stand—Harry Jensen, Chief Test Engineer, Sikorsky Aircraft division, United Aircraft Corp.

Utility of this test facility and its operational limitations are discussed. A brief account of the tests conducted is given. Features of the drive, control, instrumentation and the mechanics of the force resolution system are presented.

INSTRUMENTS

Acoustic Measurement of Airstream Parameters—Victor B. Corey, Manager, Engineering Physics division, Fredric Flader, Inc.

Since the velocity of sound enters explicitly into relationships involving the Mach number, the true airspeed, and the true air temperature of an airstream, the possibility exists that sound itself may provide a means of measuring these parameters directly. In 1946 and 1947 the author and his co-workers introduced and carried out the basic development upon a new family of instruments which have been designated STAMNI (Sonic True Airspeed and Mach Number Indicators).

A particular case known as Normal Incidence Stamm accomplishes a physical separation of variables which results in very great simplification. Mach number is measured by the ratio of a variable distance to a fixed distance. The true airspeed is measured by the ratio of the same variable distance to the acoustic transit time through the airstream between emitting and receiving transducers. Over a large range of conditions the acoustic transit time varies only with the true air temperature, and may therefore be used to measure this variable.

Current work is directed toward the application of Stamm to the measurement of Mach number, true airspeed, and true air temperature in the high subsonic transonic and moderate supersonic ranges.

An Internal Six-Component Balance for Model Testing at High Speeds—Henry H. Hoadley, Head, Wind Tunnel Section, Research Department, United Aircraft Corp.

Given are design requirements and description of six-component strain-gage balance suitable for mounting inside a small sting-supported airplane model to be tested at high subsonic or supersonic velocities. A mechanical design philosophy is stressed which provides small interaction of forces and moments and makes possible a straightforward application of the wire-type strain gage.

The design embodies the possibilities of replacing individual measuring units and thus, changes in force and moment ranges are easily accomplished. Operational experience with this balance used in an 8-ft., high subsonic speed wind tunnel installation is discussed.

A Precision Omnidirectional Radio Range for the Terminal Area—Joseph Lyman and George Litchford, Aircraft Radio Research Department, Sperry Gyroscope Co

It has been determined by national and international agreement that a radio system of polar coordinates will be employed for short distance aid in navigation and traffic control. A polar coordinate system has a single site origin. It consists of an angular measuring system and a distance measuring system and comprises the so-called RΘ system.

Measurements of distance to operationally satisfactory accuracies can be achieved by many techniques. Measurement of angular position to satisfactory accuracies has not been readily achieved nor has the necessary combination of the angular and distance systems into an overall integrated system.

Developments of omni ranges at VHF have produced angular accuracies in the order of ±3 deg, which appears satisfactory for the purpose for which they were intended—en route guidance. Operationally it appears that ±½ deg or better is required for airport area control. The VHF system, to meet airport traffic control requirements does not look feasible, inasmuch as a whole order of magnitude of accuracy improvement is involved.

Techniques developed and tested at higher frequencies have demonstrated that accuracies in the order of ±½ deg can be obtained. An automatic coarse and fine system of angular measurement has been recently achieved at these microwave frequencies (5000 mc). A sine wave pattern horizontally distributed through 360 deg provides the coarse measurement, additional sine waves superimposed on the first sine wave provide approximately a 10:1 improvement in the electronic angular measuring system much like a coarse and fine synchro repeater system.

Extensive ground and flight tests have so far been quite encouraging. Further investigation under AF sponsorship is underway to provide a precision omni range whose radio emissions, by means of a radio lens system in the vertical plane, are not seriously affected by the earth and nearby reflective objects.

AERODYNAMICS

A Mechanical Analogy for Hypersonic Flow—H. Reese Ivey, Langley Aeronautical Laboratory, NACA

A mechanical analogy for hypersonic flow is described which may be useful for the Mach range of 5 to infinity.

The basic characteristics of the various flow types are reviewed. Gas dynamics, slip flow, and free molecule flow. From that discussion the requirements are determined for an analogy to simulate hypersonic flows. The theory of the analogy is developed and a simple apparatus is described for demonstrating the analogy.

Functions of the various parts of the device are explained and typical photographs of the resulting flow are presented. The pictures show the gradual degeneration of shock waves as the effective operating altitude is increased from the gas dynamics region to the free molecule region.

Possible uses of the analogy are suggested and the operating limitations are discussed.

Lift on Inclined Bodies of Revolution in Hypersonic Flow—G. Grimminger, Scientific Warfare Advisor, Department of Defence; and E. P. Williams and G. B. W. Young, The Rand Corp.

The importance of body lift is that at moderate angles of attack and high Mach number it can constitute an appreciable part of the total lift of a winged missile. In this paper an attempt has been made to analyze body lift in hypersonic flow by an approximate method and, together with a correlation of existing experimental data, to indicate the probable variation of body lift over a wide range of Mach numbers from low supersonic to hypersonic.

The method of analysis of hypersonic flow over inclined bodies of revolution employed here has been denoted as the hypersonic approximation. It is an improvement on the Newtonian corpuscular theory of aerodynamics (also presented). The hypersonic approximation method accounts, in addition to the impact (Newtonian) forces, for the centrifugal forces resulting from the curved paths of the air particles.

The Transient Temperature Distribution in a Wing Flying at Supersonic Speeds—Joseph Kaye, Associate Professor, Mechanical Engineering, Massachusetts Institute of Technology.

Some new problems introduced by supersonic flight of a vehicle are shown to be dependent on the determination of the temperature distribution in the vehicle. Transient temperature distributions in a thin wedge-shaped wing or airfoil are calculated for the case of constant acceleration from a Mach 1.4 to 6.

A long, numerical solution of the differential equation for heat flow in two dimensions with boundary conditions dependent on time is presented and the resultant temperature distributions in the wing are given in chart form. In this solution the spanwise heat flow was assumed to be negligible. Results indicated that the heat flow problem could be reduced to one-dimensional heat flow in the direction normal to the chord without sacrifice of accuracy for a wing with a maximum thickness ratio of less than ten percent.

A shorter numerical solution of the differential equation for heat flow in one dimension—normal to the chord—is shown to yield temperature distributions in excellent agreement with those calculated by the method for two dimensional heat flow. This shorter method was used to investigate the effects of changes in the coefficients of heat transfer and in the values of the acceleration. The shorter solution is applicable to the general case of a thin airfoil, provided the variation of the local coefficient of heat transfer with time is available.

The Characteristics of Supersonic Wings Having Biconvex Sections—Beverly J. Beane, Analytical Engineer, Research Department, United Aircraft Corp.

Little has been published on the characteristics of supersonic wings with biconvex sections. Linear solutions for the characteristics of such wings of representative planforms are presented. Results are compared with those of wings of double wedge section, and the respective advantages of each indicated.

On the Stability of Two-Dimensional Smooth Transonic Flows—Y. H. Kuo, Professor, Cornell University.

Steady two-dimensional potential flows involving imbedded supersonic regions adjacent to a body have been calculated but their existence has not yet been established experimentally. To further experimentation, the question of stability of such flows is examined.

Following the standard procedure, a theoretically possible flow is disturbed at a certain instant and the behavior of the subsequent disturbance motion is investigated. By means of the transonic approximations, a simple solution valid in the neighborhood of the sonic line has been obtained.

This study leads to the conclusion that smooth transonic flows over symmetric bodies are unstable to pulses with sufficiently long initial "wave-lengths" and given "shock strength," and those over unsymmetrical bodies are stable to all pulses with arbitrary initial "shock-strength" and "wave length" so long as the slope of the body at the deceleration-to-sonic point is positive, if the body curvature is negative.

The second assertion, although no direct contradiction to existing theories, has received partial support from certain scanty experimental data obtained by NACA. The critical Mach number for observation of potential flow is defined, based on these stability criteria.

Second-Order Theory of Supersonic Flow Past Bodies of Revolution—Milton Van Dyke, California Institute of Technology.

A second approximation is developed for supersonic flow past axially-symmetric bodies, corresponding to the Busemann result for plane flow. It is found that a particular integral of the second order iteration equation can be written down at once in terms of the known first-order solution. The second-order problem is thereby reduced to an equivalent first order problem. The latter can be solved with but minor modification of the Karman-Moore procedure. The time required for computation is approximately twice as great as for the first approximation.

The second order solution is compared with the exact solution for the cone and with solutions obtained by the graphical method of characteristics for cone-cylinder bodies, ogives, and open nosed bodies of revolution. In each case the second approximation gives a great improvement over the first.

If the second order solution is expanded in powers of the thickness ratio, it agrees with a recent result of Broderick's. However, the expansion in powers is found to result in a considerable loss in accuracy.

For inclined bodies of revolution, it appears that a solution sufficiently accurate for practical purposes can be obtained by combining the second-order solution for zero angle with the first-order solution for the cross flow.

Rolling Up of the Trailing Vortex Sheet and Its Effect on the Downwash Behind Lifting Wings—John R. Spreiter and Alvin H. Sacks, Ames Aeronautical Laboratory, NACA

It is found that the degree to which the vortices are rolled up depends upon the distance behind the wing and upon the lift coefficient, span loading, and aspect ratio of the wing.

Although the rolling-up of the trailing vortices associated with conventional wings

of moderate or high aspect ratio is of little practical importance, it is shown that the converse is true for low-aspect ratio wings With these wings, the trailing vortex sheet may become essentially rolled up into two trailing vortex cores within a chord length of the trailing edge.

In addition to the theoretical calculations, the behavior of the trailing vortex system is illustrated by several photographs obtained by means of a water tank.

The downwash fields associated with the two limiting cases of the flat vortex sheet and the fully rolled up vortices are investigated in detail for both subsonic and supersonic speeds The intermediate case in which the rolling up process is only completed partially at the tail position is discussed, although the mathematical complications are such that analytical solutions are unlikely to be found except in very simple cases

The Hot Wire Anemometer in Supersonic Flow—Leslie S G Kovasznay, Assistant Professor of Aeronautics, The Johns Hopkins University

The author has conducted systematic experiments to determine the law governing the heat loss from a hot wire in a supersonic flow up to Mach numbers of 2 0 ft was found that the heat loss, expressed in the form of a Nusselt number, is a unique linear function of the square root of the Reynold's number when all dimensionless quantities are evaluated not at free stream conditions but behind a normal shock.

This law is valid only in the case of small temperature loadings For large temperature differences a non linearity appears in sharp contrast to King's law, which has been found to be linear with temperature difference over a wide range of temperature loadings

A second problem to be solved is that of obtaining adequate frequency response of the hot wire equipment in order to resolve the turbulent fluctuations in space which are swept by the wire at high velocity in a supersonic flow Encouraging progress has been made in using extremely fine wires and in developing electronic equipment that will compensate for the thermal lag of the wire at very high frequencies, without interference from noise

The third problem that has been encountered is that of interpreting the hot wire fluctuations when the number of flow parameter is large Velocity, density and temperature all contribute to the hot wire reading and it is believed that in some cases these effects may be separated

Periodic Motions of a Rectangular Wing Moving at a Supersonic Speed—T Y Li and H J Stewart, California Institute of Technology

The aerodynamic forces and moments acting on a rectangular wing moving at a supersonic speed and executing periodic motions are computed by linearized nonsteady flow theory Primary attention is given to vertical oscillations, however pitching and rolling oscillations are also considered

The aerodynamic forces and moments in terms of the conventional dimensionless coefficients, are presented in tabular and graphical form

Longitudinal Stability of Elastic Swept Wings at Supersonic Speed—Charles W Frick, Ames Aeronautical Laboratory, NACA

The longitudinal stability characteristics of elastic swept wings experiencing bending and torsional deformations are calculated for supersonic speed by the application of linearized lifting surface theory A parabolic wing deflection curve is assumed, and the analysis is simplified by considering the wing panels to be simple cantilever beams.

The method is thereby limited in application to wings of high aspect ratio for which the root effects are small Expressions for the lift, pitching moment and span load distribution characteristics are derived in terms of the elastic properties of wing, namely, the design stress the modulus of elasticity, the shearing modulus, and the maximum design load factor

The analysis applies to wings with leading edges swept behind the Mach lines In all cases however the trailing edge is sonic or supersonic

The validity of the assumption of a parabolic deflection curve is investigated by comparison with matrix calculations for a wing with the moment of inertia varying inversely with the fourth power of the spanwise dimension ft is shown that for such wings the assumption of a parabolic deflection curve gives valid results for the wing stiffnesses and flight conditions in which the designer is primarily interested

Calculations made for subsonic speed show that the aeroelastic characteristics are primarily a function of the flight dynamic pressure, at least for wings which have subsonic leading edges at all flight Mach numbers

A Method of Determining Some Aerodynamic Coefficients From Supersonic Free-Flight Tests of a Rolling Missile—Ray E Bolz Assistant Professor of Aeronautical Engineering Rensselaer Polytechnic Institute, and John D Nicolaides, Aerodynamicist, Ballistic Research Laboratories

This discussion presents an experimental technique adapted to the aerodynamic free-flight range of the Ballistic Research Laboratory, Aberdeen, Maryland A suitable aerodynamic test vehicle is gun launched by a special firing technique which results in very small pitching and yawing displacements of the test vehicle during the subsequent flight

This vehicle may be a model of any aerodynamically stable missile configuration having one or more pairs of wings and/or fins set at a differential angle of incidence to induce a rolling velocity During flight, as it passes each of 25 stations the missile is photographed (shadowgraphs) simultaneously in the vertical and horizontal planes via an extremely short duration spark discharge From the photographs, the spatial orientation of the missile is obtained, from which the linear displacements and angular displacements in roll are determined

The results indicate that the actual motion is well represented by the theory to within the small experimental errors and that excellent reproductibility of the aerodynamic coefficients in roll is obtained Coefficients show a fairly good correlation with the linearized theory considering the degree of approximation associated with the theory when applied to aerodynamic surfaces of 16 percent thickness as employed on the missiles used in the reported tests

A Contribution to Generalized Theory of Shockwaves—L. Meyerhoff, Research Associate, Department of Aeronautical Engineering and Applied Mechanics, Polytechnic Institute of Brooklyn

This paper derives and presents numerical solutions of the complete system of the Navier-Stokes equations and heat-balance equation for the problem of the shockwave structure in a steady one-dimensional, viscous, heat conducting and convecting flow Solutions are first given for the assumption of constant gas properties and for two different Prandtl numbers Solutions are then given for the more realistic case in which all of the gas properties are temperature dependent For this latter work it was necessary to compute the change in the limit values of Rankine Hugoniot due to the variable gas properties.

The numerical work for the constant gas property case, shows that the exit conditions are extremely sensitive to very minute changes in the chosen boundary conditions at the inflection point within a shockwave, and that only one highly accurate, special condition at this point leads to the uniform flow (Rankine Hugoniot values) at the exit such as given by R Becker in 1922 For an initial Mach number of 2 0 it is found that the thickness of the shockwave (as defined by Prandtl) increases to its triple value with a decrease of 12 percent in the Prandtl number

For the temperature dependent gas property analysis which follows in some points the work of R Becker, the shockwave transition region is found to be thicker than that obtained for constant gas properties, due to the increase of viscosity conductivity and specific heat with temperature.

AEROELASTICITY

A System for the Excitation of Pure Natural Modes of Complex Structures—Robert C. Lewis and Donald L Wrisley, Aeroelastic and Structures Research, Massachusetts Institute of Technology

The need for an experimental method which would allow positive separation and adequate definition of all the natural modes of a complex structure within a prescribed frequency range led to the investigation and development described in this paper under the sponsorship of the Naval Air Materiel Center

Due to limitations of either experimental equipment or technique, previous methods have used more or less arbitrarily located points of force application and have required that the natural mode response be separated from responses of other modes, inadvertently excited, by means of phase analyses

The development described here stems from the idea that if a large number of shakers were distributed over a complex structure, the adjustment of individual shaker forces, at any given natural mode frequency, could be so arranged that only the natural mode in question were excited If such an excitation could be obtained, orthogonal to the one mode, all points on the complex structure would go through their maximum excursions at the same instant Under such conditions there would be no forcing of adjacent modes and hence no phase shifts, the amplitudes of various points

of the structure would clearly define the mode shape, and smooth decays could be obtained when the mode excitation was removed.

The evolution of this concept into completed full scale equipment involved four major steps: Investigation of suitable criteria of mode purity by means of a complex model with an adjustable distribution of energy sinks, determination of suitable means of discriminatory action in adjustment of multiple shaker forces to achieve mode purity as indicated by the criteria discovered, evolution of a working system, based on practical requirements, on which to base the design of full scale equipment; and construction and test of the full scale equipment.

Solution of Aeroelastic Problems by Electronic Analogue Computation—Jonathan Winson, in charge of Dynamics, Pilotless Plane division, Fairchild Engine and Airplane Corp.

The ease with which complex physical problems are resolved by machine computation of the analogue type has led to an inspection of flutter and related aeroelastic phenomena with a view toward automatic solution of these problems. It is found that automatic solution is feasible and can be carried out in the following manner: the basic aeroelastic equations for arbitrary wing motion are written in suitable form and entered in a commercial electronic computer. Elastic, inertia and aerodynamic properties of the physical system are translated into fixed potentiometer settings of the computer, a small number of variable settings being reserved for aircraft forward velocity and initial flight conditions.

Effects of the vortices in the wake of the wing are represented by the outputs of simple electrical filters. For the understanding of the flutter characteristics of an aircraft say, machine runs are made at several forward velocities, the wing in each run being disturbed initially. Pen traces of the resulting wing oscillations as functions of time yield all required dynamic information. The oscillations diverge above the flutter speed.

The Gyroscopic Effect of a Rigid Rotating Propeller on Engine and Wing Vibration Modes—R. H. Scanlan, Associate Professor of Aeronautical Engineering, and John C. Truman, Rensselaer Polytechnic Institute.

In many wing vibration analyses it is found necessary to take into account the effect of flexibly mounted engines. Hence it is reasonable to ask what vibratory gyroscopic effect this flexibility may give rise to when propellers are whirling. An engine mount may be thought of as a horizontal beam cantilevered from the wing, having both horizontal and vertical flexibility. If this beam were infinitely rigid horizontally, then when it vibrated, the gyroscopic moments induced in the propeller due to the resultant pitching motion of its axis would not produce propeller axis yaw. However, engine mount lateral stiffness (which allows propeller axis yaw) may actually be less than vertical stiffness so that gyroscopic effects will play a role as the propeller axis undergoes pitching vibrations at the tip of the cantilever engine mount. Purpose of this paper is to investigate this role under the assumption that the propeller itself is a rigid disc.

A Recurrence-Matrix Solution for the Dynamic Response of Elastic Aircraft—John C. Houbolt, Langley Aeronautical Laboratory, NACA.

A systematic procedure is developed for the calculation of the structural response of an airplane subject to dynamic loads. Particular attention is given the problem of determining the stresses developed due to flight through gusts. Difference equivalents for derivatives and matrix notation are used to develop a recurrence relation which permits rather easy step-by-step calculation of the response and of the loads which occur on the structure. The chief feature of this approach is that the recurrence relation is derived directly from the basic equilibrium relations of the system without the introduction of such devices as normal modes, the Laplace transform, etc., generality is maintained and yet the operations involved not only retain physical significance but also are easy to apply.

The fundamentals of the present recurrence approach in the solution of dynamic problems are first illustrated by means of a simple damped oscillator example and the application to the flexible aircraft structure is then made. The method takes into account wing bending and twisting flexibilities, fuselage flexibility, vertical and pitching motion of the airplane and some tail forces. Either a sharp edge gust or a gust of arbitrary shape, spanwise or in the direction of flight, may be treated.

Some results obtained by application of the recurrence matrix relation are presented and the advantages of this approach over other methods of evaluating the dynamic response of an aircraft are discussed.

METEOROLOGY

Observations and Theory of Flow Over Long Ridges—Dr. Joachim Kuettner and Capt. Philip Duncan Thompson, Atmospheric Analysis Laboratory, Geophysical Research Directorate, AF Cambridge Research Laboratories.

Analysis of soaring flights in the airflow over high ridges provides a qualitative description of the flow up to 35,000 feet, and "mother of pearl" clouds give an additional clue to the flow structure up to 80 000 feet. The use of radar position finding systems, pressurized sailplanes and improved soaring techniques is expected to yield more complete and accurate information in the near future.

Typical examples of the flow required by the Lyra theory, which among several conflicting hypotheses has produced the most realistic results are compared with observations. The differences between theory and actuality will be resolved only by considering more general distributions of wind and temperature.

Influence of Wind Gradient and Unsteady Flow Effects on Short Takeoff Runs—Holt Ashley and Donald Nielson, Department of Aeronautical Engineering, Massachusetts Institute of Technology.

Aircraft taking off over a distance of 25 chordlengths or less are shown to experience an appreciable loss of lift due to unsteady flow effects. A simplified approximate iterative approach is presented for evaluating the true lift buildup during any takeoff run and climb. This method is applied to a number of examples, including Wagner's problem. Important effect of headwind in counteracting the lift loss is demonstrated, real influence of vertical wind gradient on rate of climb after takeoff is discussed.

Vortex Thermometer for Measuring True Air Temperatures from an Airplane—Bernard Vonnegut, General Electric Research Laboratory.

The aerodynamic heating experienced by a thermometer can be very nearly eliminated over the operating range of a B-17 airplane by mounting the thermometer in the center of an air vortex created by a simple housing. This method has been found to simplify air temperature measurements made in flight and shows promise for measuring temperatures in clouds. Designs, and data taken in flight, are presented for several vortex thermometers.

Measurement of Temperature in the Presence of Water Particles—Patrick J. Harney, Department of Meteorology, Massachusetts Institute of Technology.

The standard methods of getting free air temperature by aircraft are reviewed. The thermo-aerodynamic effects introduce large errors easily corrected for in clear air. In the presence of water drops the temperature depends upon the sampling, but that recorded is a function of the wetness and ventilation of the thermometer. The latter are dependent upon the type of shielding or housing used.

The collection efficiency of various housings is discussed with reference to flight and wind tunnel tests. Effect of surface roughness of the temperature element itself is noted. Some cases of large, unexpected temperature changes are mentioned.

Results of Recent Investigations of the Meteorological Conditions Conducive to Aircraft Icing—William Lewis, U. S. Weather Bureau.

Flight investigations undertaken by the NACA and other agencies to obtain data for use in the design of ice prevention equipment, have resulted in the accumulation of a considerable amount of data on the values of liquid water content and drop diameter ordinarily found in clouds of various types.

Median values of liquid water content measured in cumulus, stratocumulus and altocumulus clouds are .34, .22, and .10 gram per cubic meter, respectively. Corresponding maximum observed values are 1.7, .8 and .4.

Average observed values of drop diameter are greatest in cumulus, and least in stratocumulus clouds, but the differences between cloud types are small compared with the variations within each type.

Icing conditions in the upper portions of large cumulus congestus clouds are much more severe than any encountered in other cloud types, but because of their limited horizontal extent, flight in such conditions can usually be avoided. Icing conditions in stratus and stratocumulus clouds are usually light or moderate in intensity, but constitute one of the chief icing hazards to airplane operation because of their large horizontal extent. Ordinarily, significant icing conditions do not occur in altostratus clouds or in large areas of general precipitation because the presence of ice crystals prevents the formation of liquid water drops.

Aircraft Built by Outside-In Jig Technique

New "envelope jigging" procedure offers many production advantages.

By Frederick R. Brewster
(*McGraw-Hill World News*)

London—A new technique of using jigs, developed by the British, may bring great changes in aircraft production.

Normally, aircraft subassembly structures are built from the inside out—the framework erected first and then the skin applied.

But now The Fairey Aviation Co., Ltd. of Hayes, Middlesex, has reversed the procedure and perfected a new construction method, whereby outside skin is the first part of the structure to be shaped and located, and the ribs and other internal members then added.

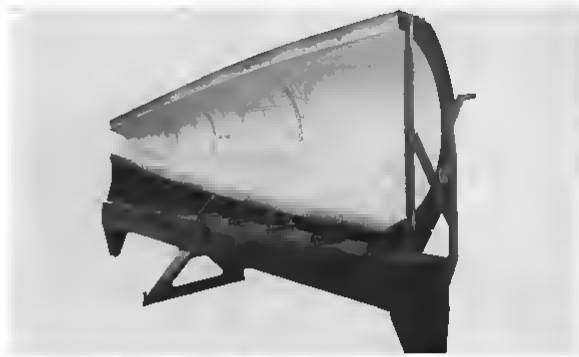
▶**Producibility Factor**—Fairey technicians worked out the new technique over the past four years, after making intensive studies of British and American practice. Fairey officials had become convinced during the recent war that better production methods than those in use at present were essential to improve the "producibility" characteristics of aircraft.

Moreover, Fairey sought to better prepare itself for going into quantity production of new aircraft types when this might be required in the postwar years.

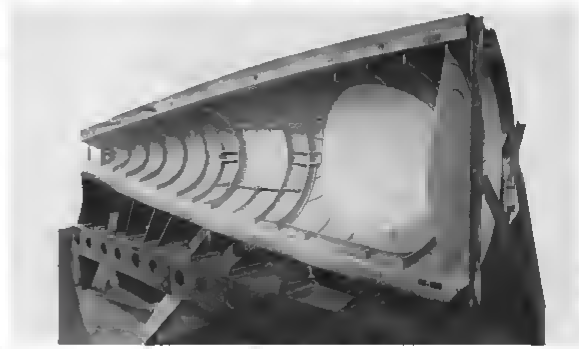
The new method, which the company calls "envelope jigging" since it is based on the outer aerodynamic form of the finished aircraft, has been applied for the first time to the tooling and construction of a complete aircraft in its prototype stage with the new Fairey 17. This is a carrier-based long-range anti-submarine patrol plane powered by the Armstrong Siddeley Double Mamba turbine propeller engine driving coaxial contrarotating props.

The procedure has been tested and perfected in the construction of some components for Fairey's earlier postwar projects, such as the Primer and the Operational Trainer as well as the Gyrodyne. And the company states that it will be used on all subsequent types developed by Fairey.

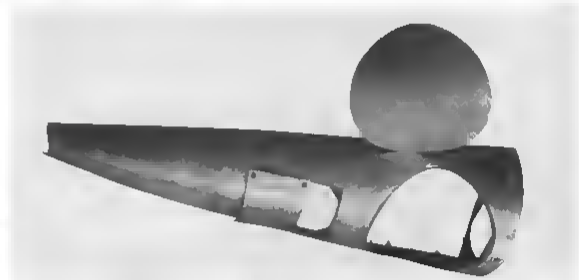
▶**Advantages**—Using the new production method from the outset (as has been done with the Fairey 17), makes the prototype, in effect, the first production aircraft, so that the desirable feature of interchangeability of parts is obtained beginning with the initial aircraft. Ordinarily, this interchangeability is attained only gradually during the construction of the first 10-20 craft.



JIG SKIN, carrying locations for various structural units, serves for



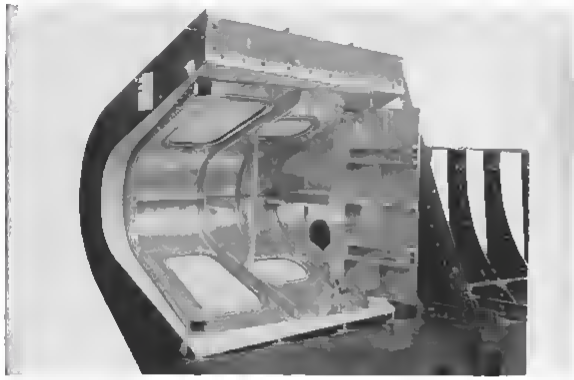
COMPONENT ERECTION of bottom aft fuselage. With members riveted



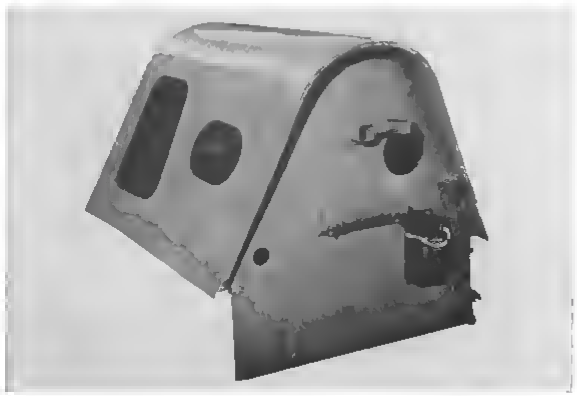
STRUCTURE IS REMOVED from jig as completed section of the aircraft

Other advantages pointed out for the new procedure are:

- Control over the final skin contours of the design is retained throughout the early construction stages, since minor inaccuracies in building do not



FIXED HOODING fabrication, including openings for windows, gives this . . .



COMPLETED COMPONENT, ready for attachment to adjacent sections of aircraft

accumulate to make dissymmetry a real problem and cause delays during flight testing.

These external contours, in essence the initial lines to be firmly settled and "frozen" on any new type, are the first to be transferred from drawing board to metal, in the new technique. The objective (and the achievement) of the Fairey system is to preserve the designer's original intentions. Any inaccuracies that occur during building grow inward, rather than outward.

- Accuracy of frame and rib spacing and cleavage lines is ensured.
- Work on the jigs can start much earlier—as soon as the shape of the aerodynamic envelope has been settled, which is of course, very early in the design stage.

Thus, by the time that detail design has been completed, the jigs nearly can be ready for construction to proceed. Also, this early work on jigs can be carried forward, with the knowledge that the basic construction of the jig will not be changed unless the fundamental form of the aircraft is changed.

- When frames, ribs, etc., are manufactured, they can be checked for accuracy of profile in the jig, before they are assembled.
- Cost of construction of the prototype by this method is little different from that when conventional methods are used. And in the production-stage the technique has many obvious advantages. One is that once the skin plates are in place in the jig, a number of riveters can go to work immediately, with no delay for lining up, etc.
- Under large-scale subcontracting that can be expected during any wartime expansion of production, the subcontractor can hardly go wrong once the jigs have been built and delivered to him.

▶ **How It's Done**—Aim of the envelope jigging procedure, as has been suggested, is to make the external form of the aircraft conform as closely as possible to the designer's intentions. Hence, the method takes these external lines and builds jigs to conform to them.

As soon as the final skin contours are known, they are lofted in the usual way and heavy gage formers are prepared and mounted in the appropriate stations on cast square section jig bases. (These jig bases are standard structures which can be used for any type of component by merely varying their lengths.) Spacing of the formers naturally varies with the part to be made in that jig.

Into the formers is then mounted the jig skin, whose thickness has been allowed for in lofting the formers, so that the inner face of this skin will conform to the outer surface of the aircraft's skin. Small compound curvatures of the jig skin can be accomplished while fixing it in place in the formers, more complex shapes must be preformed.

Inner face of the jig skin is then sprayed with a light paint, to provide a suitable drawing surface. Outline of the component to be built, as well as the position of all the sheets, rivet holes, etc., are then marked out on this surface with special scribing devices. These are mounted on a portable (wheel fitted) table, which is lined up in front of the jig base to previously determined datums.

This marking out is then checked, insuring greater accuracy over traditional methods, since frame positions, etc., can be checked full scale, eliminating drawing errors.

▶ **Drilling, Riveting**—After checking, the rivet holes are opened out to a diameter of ½ in., since both drilling and riveting take place in the jig. The jig skin thus becomes, in effect, a drill-template. Drilling of the sheets in the component being built is done from the outside of the jig through the holes in the jig-skin. Air drills are used, fitted with a special tubular head in which slotted guides control the depth of penetration of the bit and provide for drilling and countersinking in a single operation.

Riveting is done from the inside of the jig, with the rivet heads bucked from the outside, through the holes in the jig skin.

Milling of the rivet heads to give a flush surface to the outer face of the finished component is done from the outside of the jig, using the same air drills as before, fitted with a milling cutter.

Where doors, windows, hatches and other openings are to be made, they are

built in the jig along with the adjoining parts, thus guaranteeing an automatic fit. Modifications of the internal structure, when required, can be adapted into the jigs with very little trouble, either by preparing a new jig skin plate, or by drilling new holes and plugging those no longer needed.

Outside jigs for checking the external shape of components are not new. In the construction of the laminar flow wings for the Armstrong Whitworth A.W. 52 all-wing research aircraft, laminated plastic members clamped in the jig were used as formers for the skin panels of the wing sections. And drilling and riveting in the jig have also been done before.

But the Fairey scheme is believed to be the first where external jigs control the complete structure.

►**Organization Changes, Too**—Fairey has reorganized its technical setup to fit the new method. In the past, the Airframe Design Staff have worked more or less as an independent unit, and only when a particular aircraft was about to be put into production were Tool Design Staff allowed to come into the picture.

At that stage, production-type assembly jigs were designed and built, which could only be proved on the first production aircraft. This meant that these jigs were designed under pressure for speed, and second thoughts were difficult to incorporate because the jigs were already in use and the delay to production involved in making any changes in assembly methods could seldom be permitted—particularly when large quantities of components had already been completed by the original scheme.

Now, Fairey's Jig and Tool Staff (renamed the Production Development Group) has been reformed into three sections. One section works right alongside the airframe designers in the design office. It is responsible for scheming the main and sub-assembly jigs for the components to which it is assigned, as the design progresses, and at the same time for maintaining liaison with the lofting department.

Second section is concerned with the manipulation and manufacture of sheet metal parts.

Third section deals with all machined parts.

Continuous liaison between the design office and the factory floor, achieved by this new Production Development Group, means that any difficulties in assembly or troubles on the jigs are made known to the designers while the prototypes are being built, while the jigs are always capable of being modified so as to be ready for production immediately the order is received.

FINANCIAL

Airlines '50 Profit Outlook Studied

Indiscriminate air coach growth and mail pay cuts are seen by survey as factors that could limit earnings.

A cautious view of potential airline earnings is advanced by Standard & Poor's in a current review.

This investment advisory service declares that prospects favor further moderate growth in airline traffic over coming months. The outlook for profits, however, is believed to be less clearly defined primarily because of the uncertain extent to which coach fare-expansion may divert regular fare traffic. Also, the striking gain in 1949 profits may invite a cut in mail pay, particularly in view of pressure for greater economy in government expenditures. Apart from the latter possibility, the service asserts that year-to-year earnings comparisons may be moderately favorable over the near-term, thus encouraging resumption of dividends by an increasing number of companies.

▶**Good Business Expected**—In support of its position, Standard & Poor's asserts that general business conditions are expected to remain extraordinarily good at least during the first half of 1950. Passenger fare boost of 12½ percent by 61 eastern railroads in November, 1949, raised first-class railway and coach tariffs between major travel centers above comparable airline fares.

Also, the activities of irregular air carriers have been reduced materially since mid-1949 by Regulation 292.1, military personnel are being carried at a 10 percent discount since July 1, 1949, and the Civil Aeronautics Board extended approval of air coach and family-fare discounts to June 30, 1950, while trans-continental coach tariffs of American and TWA expire with 1950.

The investment service declares that further moderate growth in passenger traffic (barring industry accidents), diminishing growth in freight business, and mail compensation at around the high annual rate of 1949 are indicated over the near-term. The outlook for comparatively stable labor, fuel, and material costs contributes to the expectation of generally satisfactory year-to-year profits comparisons in the 1950 first half. Final results will be affected importantly by the extent to which the growth of air coach business cuts into regular-fare traffic.

▶**Air Coach Competition Up**—The advisory service makes the significant statement that success of original air coach services at 4 cents-a-mile (standard tariffs were 6 cents) initiated beginning late in 1948 by Capital, TWA and Northwest, stemmed from their limited availability, over-average seating capacity, selectivity and long hauls. Some of these characteristics are rapidly disappearing, as CAB authorizations late in 1949 permitted parallel competition by Capital and Eastern (New York-New Orleans), Eastern and National (New York-Miami), Delta and Eastern (Chicago-Miami), and American and TWA, New York-Chicago-Los Angeles since Dec. 27 at 4.5 cents a mile. These awards appear to bar the Board from disqualifying petitions of other airlines despite its September, 1949, statement against broad and indiscriminate expansion of air coach. While air coach is expected to promote air travel, the statement sees a risk that uneconomic conditions may develop.

Standard & Poor's expands this potential jeopardy in some detail. First, seating capacity is being enlarged to equalize the effect on revenues of the reduced fares, at a time when the industry's basic problem is over-expansion. Second, the prospective gain in traffic may be insufficient to allow profitable operations without serious diversion from standard schedules. Third, trans-continental and other long-haul air coach flights show promise, but disparities in fares among regions may force marginal short-haul airlines to offer discount flights.

▶**Operating Costs Rigid**—Supplementing this reasoning, the service asserts that the bulk of airline operating costs are relatively rigid and the resultant leverage is substantial. If air coach tariffs do not produce a sufficiently large increase in traffic, overall profits would be subject to dilution. Conversely, an adequate gain would presumably redound largely to the benefit of earnings. There is also the possibility of mail rate reduction in the event of sustained good profits over the medium term, since compensation received by all companies, according to Standard & Poor's, except American and Eastern is on a subsidy basis.

The service expects the airlines serving the international field to experience favorable operations during the 1950 first-half. In 1949, combined revenue passenger-miles gained some 14 percent, and mail and freight tonnage rose sharply. Net operating income is estimated to have approximated $20 million compared with $13,947,216 in 1948. Widespread devaluation of foreign currencies in September, 1949, led the 69 commercial airline operators, representing 41 countries, to hold 1950 fares at existing levels in dollar areas.

Attention is called to special fare inducements prevailing early this year. Due to these special bargain fares, and the Catholic Holy Year celebration in Rome, the investment service expects that air traffic to Europe will be unusually heavy during 1950.

▶**Earnings Estimated**—Of particular interest is Standard & Poor's estimated earnings for 1949 among the separate airlines. For comparison purposes, final 1948 results are shown.

These comparative earnings, with 1949 estimated by Standard & Poor's, are as follows. (On a common share basis)

	1948	1949
American	$0.67*	$0.90
Capital	0.26	3.00
Eastern	0.98	0.75
Northwest	1.51*	0.80
Pan American	0.75	0.80
TWA	0.24*	1.50
United	0.72*	0.80
Braniff	0.19	0.25
Chic. & South	1.26	1.25
Western	0.26	0.70

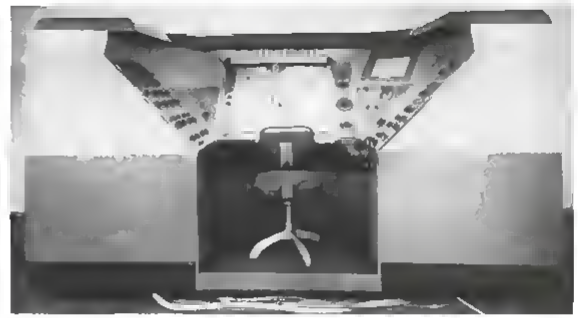
*-deficit

It is noteworthy that Eastern is the only carrier whose 1949 earnings are estimated to be lower than for 1948. While Colonial is not shown, that carrier is expected by the service to have operated at a loss during 1949. The 1949 estimated earnings for Capital presumably include the profit realized by the company on the retirement of its debentures last year and probably does not give effect to the possible dilution of the common by the potential conversion of debentures outstanding.

Importance of leverage in airline operations is also highlighted by Standard & Poor's estimate of 80 cents per share for Northwest last year. For the nine months ended Sept. 30, 1949, this carrier earned $2.01 per share. The accelerated degree of loss which set in starting sometime in October may easily support the investment service's estimate of final 1949 results.

(Ed. Note—The opinions reviewed are those of the advisory service and not necessarily those of this writer. Neither the writer nor AVIATION WEEK *stands sponsor to or endorses the advisory service indicated above.)*

—Selig Altschul



COSTS ARE CUT by using instructor's station with present instrument trainers

New Low-Cost Navigation Trainer

Link offers electronic device designed to train pilots in procedures outlined in ANDB's facilities program.

An electronic training device designed to give realistic, low-cost instruction in the radio navigation procedures proposed under the Air Navigation Development Board's interim facilities program, is being offered to airlines by Link Aviation, Inc., Binghamton, N. Y.

Called the all-weather automatic radio aids unit, the device is an instructor's control station equipped for complete training of pilots in present and future radio navigation techniques expected to come into use in the next few years.

▶ **Ties to Present Link**—To cut costs Link has designed the new instructor's station for use with present instrument trainers owned by airlines. It replaces the wind drift, radio, crab and desk now used with the C-8, 1-CA-1, F and ANT-18 student Links—requiring only that the outmoded part of current trainers be modified. The new unit will become an integral part of all Links built in the future.

The device incorporates such equipment as the ID-249 cross-pointer, radio magnetic indicator, omni-directional range, distance measuring equipment, arbitrary course computers, and ILS and GCA instrument approach aids. It reportedly is the first to be capable of reproducing a number of radio stations simultaneously in any given geographical area, so that the pilot may be taught a realistic instrument navigation situation.

▶ **Cross-Country**—The instructor can give complete cross-country training simply by continually relocating his hypothetical radio stations in a leap-frog procedure.

A minimum of two station locators is provided with all controls necessary for setting in type of station, frequency, call letters, maximum range and approach bearing. Static, signal attenuation, marker beacon locations, maximum reception range can be set to accurate values for the problem being flown.

The instructor can set in the radio station at any desired point on the frequency band. The pilot, using controls identical to those in the actual airplane, is required to tune to the proper frequency in the normal manner. Voice facilities permit the instructor to simulate tower, range control, GCA controller or any ground control desired. Communications may be made on low frequency or VHF.

▶ **Flight Record**—A constant record of the pilot's flight path is pen recorded on a 22 x 22 in. area. When distance is scaled to 1 in. = 32 mi., straight-line flights up to 1000 mi. can be recorded on a single RPD chart. Large scales, 1 in. = 1.2 mi., with charts of appropriate ratio, permit accurate tracking of instrument approach problems. The inputs to the recorder include true air speed, wind direction and velocity. This last may be up to 120 mph. from any direction—double the maximum available in previous training equipment of this type.

The instructor may select any one of eight call letters for VHF, and any one of four for low frequency stations. Removable cams provide for further variety of call letters.

▶ **Saves Instructor's Time**—A major advantage of the unit, according to its maker, is that the only adjustments required of the instructor are those the machine cannot compute, such as frequency and location of station to be used.

Since these few adjustments are made prior to the flight, and the instructor is relieved of the duty of simulating signals, etc., he is left free to devote his full attention to evaluating pilot performance and correcting errors in procedure.

This means more emphasis on proper voice procedure, more complete simulation of air traffic control and in general more effective training periods in radio navigation.

Titanium Tubing

Commercially pure titanium tubing, offered in limited quantities by **Superior Tube Co.**, Norristown, Pa., is specially suitable for applications where lightweight, strength and high corrosion resistance take precedence over cost for material.

Analysis limits have been tentatively fixed on product as follows: Titanium 99.5 min., iron, .15 max., silicon, .15 max., magnesium, .10 max., nitrogen, .15 max., oxygen, .20 max., carbon, .05 max.

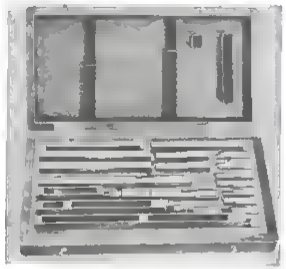
Coming in three standard tempers, annealed, half hard and hard drawn, tubing has these properties when annealed: Ultimate strength, 80,000 psi max.; yield strength, 40,000 psi min., elongation in 2 in., 25 percent max., hardness, Rockwell B, B95 max.

Tubing has been produced in sizes ranging from ¾ × .049 in. wall to ½ × .010 in. wall. With development underway, firm eventually expects to have heavier wall thickness and seamless tubing available.

All-Weather Mounts

Silicone rubber mountings, which will carry design loads and dampen vibration within temperature ranges of −100F to 500F, are announced by the **Connecticut Hard Rubber Co.**, of New Haven, Conn. Called Cohrlastic, the new mounts will protect delicate instruments where climatic conditions ordinarily are either so cold as to render rubber stone hard, or hot enough to make ordinary rubber mountings soft and gummy.

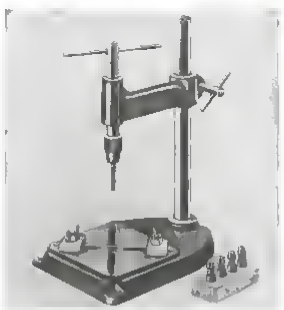
Mountings are available in many sizes of AN instrument series and can be designed where temperature resistance is required with vibration characteristics of a shear type mount.



Gage-Block Accessory

Accessory set, J 19, designed for use with all makes of precision gage blocks is offered by **Jansson Gage Co**, Detroit, Mich. Furnished in hardwood case, set includes jaws, straight edges and adjustance holders in various sizes, as well as center pointer and scriber.

Jaws, used for assembling temporary limit gages for external and internal measurement, are furnished in six sizes. Two four-blade type straight edges are included, said to be straight to within four millionths of an inch per inch of length.



Bench Tapper

For tool and die shops, experimental departments, service units and light assembly operations, Model H T 250 hand tapper, offered by **H D Herder Tool Specialties Co**, 2424 Brook Dr., Kalamazoo, Mich., is bench type machine designed for small-hole precision work.

Device is designed to accurately tap right angle holes and is represented to reduce breakage and increase tap life. Four collets, handling standard shank sizes and taps from No. 0-4 in. are supplied with each machine. Permitting use of right and left hand taps, unit has spindle arm which can be adjusted on both the lateral and the vertical axes.

Maximum distance from working surface of machine to bottom of tap is 6 in. Adjustable clamps are provided for securing work to base.

Hand Truck

For aircraft plants, fixed base operations and airports, lightweight hand truck, No. A-106, made by **Sage Equipment Co**, 30 Essex St., Buffalo, N. Y., features one-piece, all welded steel construction.

Supplied with solid rubber wheels or 5-in. diameter, semi-pneumatic tires, truck also is available with curb or step climber and solid nose. Finished in yellow enamel for easy spotting, unit has 13¾ × 45-in. frame, weighs 18 lb.

Thread Chasing Aid

Mentoll' lathe attachment, offered by **Motch and Merryweather Machinery Co**, 715 Penton Bldg., Cleveland 13, Ohio, permits external or internal thread chasing to be performed easily by machine operators who are not specially trained for this job.

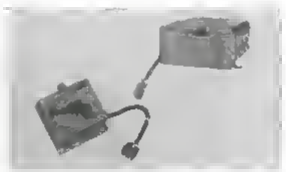
Device automatically retracts lathe tool from the work at any desired setting and simplifies chasing of precision threads. Small or large lot production can be done on ordinary lathe with repeatable accuracy. Unit is quickly mounted on any 9 to 14-in. capacity V-wayed machine.

Hydraulic Seals

For 3000-psi aircraft hydraulic equipment, AN6290 O-rings made to Specification AN-G-35 and fabricated from special synthetic rubber, are offered by **Parker Appliance Co**, Cleveland, Ohio.

Material (Parker compound 145-140) has tensile strength of 1340 psi., Shore "A" hardness of 88 deg., 100 percent elongation, and adequate freeze resistance at −65 F. It is believed to be only one yet available which meets all requirements of AN-G-35 at this temperature.

Rings are used for seals at port fitting connections on valves, cylinders and other hydraulic accessories. Available in sizes from 3 to 16 (⅜-1 in. o.d.), they are identified by yellow paint stripe ⅛ in. wide around entire outer circumference. Other molded gaskets and parts are also available in this special new compound.



Remote Receiver

Remotely controlled VHF receiver, Model LR-5BR, with small cockpit tuning control unit, Model LR5 CR, designed to permit flexible mounting arrangements, is announced by **Lear, Inc.**, 110 Iona Ave., N.W., Grand Rapids 2, Mich.

Receiver can be mounted in any convenient position in fuselage. Featuring continuous tuning for all VHF tower, radio range and VOR reception facilities, it weighs only 3 lb. 11 oz. and measures 3¾ × 6⅞ × 10¾ in.

Cockpit tuning control unit, intended for easy tuning and day or night readability, can be mounted in numerous positions to suit pilot's convenience. With dimensions of 1⅞ × 3⅜ × 3¾ in., unit weighs only 6 oz.

Radio Panel

Special panel for Narco radio equipment in Beechcraft Bonanzas now is being produced by **National Aeronautical Corp.**, Wings Field, Ambler, Pa. New panel consolidates all controls and instrumentation, with exception of left right meter which is located on regular instrument board. Special panel and control knobs are finished to match closely with rest of instrument installation on Bonanza.

Improved Tests for Pilot Skills

High level of objectivity and consistency found in new method of measuring flyers' basic proficiency.

A new "objective" flight-check report designed to minimize the check-pilot's personal bias or shortcomings while emphasizing a standard set of maneuvers of critical importance in piloting a transport plane is currently receiving its finishing touches.

The revised procedure was developed after two years' work by the American Institute for Research, Inc., Pittsburgh, which was financed in its studies by the Civil Aeronautics Administration. In summarizing its recent work, the institute emphasized that the new flight check is for use in the original certification of airline captains and is not designed to replace the airlines' six months check.

▶ **Other Uses**—Although the revision is a possible substitute for the present CAA pilot flight test report (CAA form ACA 342A), the institute noted that "the problems of flight checking on the six-months checks are very similar, and many of the methods and some of the maneuvers should be equally applicable."

Problem of the six-months check is now being studied by the research group.

It believes that the same principle of objective testing also may be applied advantageously to examinations for private and commercial pilot's certificates and instrument and instructor's ratings.

Air Line Pilots Assn., which originally was very skeptical of the whole psychological research program, cooperated extensively in tests leading to development of the new flight-check report.

Some wariness concerning the program still exists.

▶ **Views Differ**—The American Institute of Research observed that check pilots differ widely in their opinions of what maneuvers should be included in the flight-check. In constructing its new, objective flight check, the research group determined the most critical maneuvers by studying accident reports and analyzing interviews which had been conducted with several hundred airline pilots and CAA agents.

Pointing out that flight check forms in current use are generally filled in on the ground, the institute said this means that the accuracy of the check-pilot's judgment depends to a large extent on how well he remembers what occurred during the flight. It added that many studies on reports of eye-witnesses have shown that memories of specific events tend to become blurred and distorted.

Check-pilots using the objective flight-check need not rely on memory because all recording is done in the air immediately after observations are made. Further, the institute declared, "the check-pilot can devote his entire attention to observing and recording since it is planned that he conduct the check from the jump seat and that a safety pilot be provided to watch for other traffic from his position in the right-hand seat."

▶ **Vagueness Eliminated**—Even though observations are made and recorded immediately, present reports do not always convey the same impression to others. Many currently issued flight checks consist of a list of maneuver titles with spaces following each for recording whether the pilot's performance was "good," "fair," or "poor." Such reports, the institute declared, can mean quite different things to different people.

"But pilots checked with the revised flight check are assured that the judgment of their performance will be based on objective, detailed records of what occurred during the check-flight," according to the institute.

This objectivity of the new report is attained by use of:

- **Pictorial diagrammatic aids** which portray various courses and attitudes of the plane for easy reference and comparison by check pilots.
- **Quantitative data** such as those which can be read accurately from flight instruments.
- **Precise descriptions**, not, for example, "how well" a pilot accomplished the ILS approach as a whole, but specific data such as whether after the procedure turn he overshot or undershot the localizer or did not use the check list.

Check pilots differ in the standards they expect pilots to meet, the institute continued. "Besides the fact that most flight checks do not specify standards in operational terms, there are differences due to variations in check-pilot proficiency, training and attitudes. On the other hand, standards on the objective flight check are the same for everyone.

"Many flight checks do not spell out

CAB CHAIRMAN CHECKED OUT

Pan American Airways President Juan Trippe (left) was a smiling observer as Civil Aeronautics Board Chairman Joseph J. O'Connell, Jr., and CAB Chief Pilot Robert V. Garrett recently tried out the Curtiss-Wright Dehmel Electronic Flight Simulator used by PAA and other airlines for training Stratocruiser crews. Besides inspecting the trainer, O'Connell went through Pan American's shops at LaGuardia Field.

the task of the pilot to be examined, and he is uncertain as to precisely what is expected of him For example, some check-pilots consider it most important not to lose any airspeed, while others emphasize maintenance of a constant altitude"

▶Pre-Flight Discussion—The objective flight-check stipulates that the check-pilot and examinee discuss the flight on the ground so that the examinee knows in advance the limits he is expected to maintain Each point to be covered in the objective flight-check is outlined to minimize the possibility of misunderstanding by the examinee

Under present checking procedures, not only do examinee pilots frequently disagree with the check pilots concerning their flying proficiency, but check-pilots flying on the same flight often disagree in their ratings of the examinee's skill

High agreement between check pilots reportedly is obtained in the objective flight-check The new procedure is said to disprove the idea that a pilot's skills differ markedly from flight to flight and day to day And if the pilot examinee wants to know whether he has done a good job, he need only refer to the record, which clearly denotes his strong points and weaknesses

▶Test Cited—Consistency of the objective flight check procedure in measuring basic skills has been pointed up in tests which have been conducted with Air Force, CAA and airline personnel, the institute said

First trial of the new flight-check was conducted with USAF pilots at Barksdale Field, Louisiana Twenty-seven pilots flew the check flight twice They were observed on the first flight by two check-pilots and by two different check-pilots on the second flight Good check-pilot agreement on the same and different flights was demonstrated

The check was revised on the basis of findings in the first tryout and repeated on 26 CAA examiners and instructors at Oklahoma City Here the results were even better, and higher rehabilities were obtained than in any earlier types of flight checks, the institute declared

▶Airlines Cooperate—The airline tryout compared the objective procedure with the one in current use—CAA's flight test report form ACA-342A A total of 63 experimental flights were made by American Airlines, TWA, Eastern Chicago & Southern, Mid Continent, Northeast, Northwest Delta and Colonial

Each pilot "applicant" flew two check rides on different days On each ride, CAA agents and airline observers rated the applicant's performance in the new objective flight check booklet and on the CAA ATR flight test report There were different observers on the first and second rides in each instance

Result was that with the objective flight check, there was 88 percent agreement on successive days as to whether or not the applicant was qualified By contrast, on the present CAA flight test report there was only 63 percent agreement

▶Better Results Expected—Institute officials expect even higher agreement among check-pilots as they become better acquainted with the new testing procedure

The recent tests, the institute asserts, provide clear evidence that check-pilots using the new flight-check are able to agree in their ratings of pilot performance, and that the objective flight-check gives consistent results Final revision of the new flight-check report will be made on the basis of comments and suggestions of pilots and check-pilots who have used it A manual will be prepared later

Navigation Aid

A powerful mercury vapor light on the tower of the John Hancock Mutual Life Insurance Co's new building in Boston has been classified by the Civil Aeronautics Administration as a "true aid to air navigation"

EAL-IAM Sign

Eastern Air Lines and the International Assn of Machinists have signed a new two year agreement covering all employment conditions except wages, which are still in dispute

New agreement calls for an improved "injury on the job" benefit which will pay full wages for six months to five-year or more employes injured on the job, before the worker begins collecting workman's compensation Younger employes are reported to benefit by proportionate amounts

Employes start the plan with amounts of injury and sick leave "in the bank," accumulated according to the number of months of service

Idlewild Service

Durham Aircraft Service, Inc , has established an airport sales center at New York International Airport Hangar One, designed to supply maintenance units at Idlewild with parts and equipment on short notice

Supplier claims it has cut the time for such procurement to about 10 or 15 min., when previously it took from two days to two weeks Acting manager of the Durham facility is John Pfanz

Air America Gets Show Cause Order

CAB charges big nonsked maintained high frequency of operation and had pooling pact with Viking.

Air America, one of the nation's "big four" transcontinental nonscheduled operators during much of 1948 and 1949, has been ordered to show cause why its letter of registration as a large irregular carrier should not be revoked for knowing and wilful violation of the Civil Aeronautics Act

The Civil Aeronautics Board gave the Los Angeles company 15 days to answer a series of charges involving alleged illegal activity. Officials were directed to preserve all documents and records pertaining to operations since early 1948

▶Rapid Rise—Headed by Fred A Miller Air America skyrocketed into prominence soon after it started $99 coast to-coast flights with leased DC-4s in July, 1948 While flying only the last six months of 1948, it carried nearly 11,000 passengers to rank third among trans continental nonskeds for the year

From Jan 1 to Apr 1, 1949, Air America voluntarily suspended all operations and subleased its planes Miller said he hoped this prolonged break in activity would help establish a pattern of irregular operations as required by the nonscheduled exemption

▶AA Plaint—Earlier, in August, 1948, American Airlines had complained to CAB against Air America's allegedly regular flights and had charged that the nonsked had entered into illegal traffic agreements with other uncertificated carriers Action on American Airlines' complaint was held in abeyance by CAB following receipt of notice that Air America would suspend operations in first quarter 1949

But now CAB charges that Air America operated frequently and regularly between Los Angeles, San Francisco and New York since it resumed operations last April CAB has consolidated American Airlines' complaint against Air America into the Board's own proceeding against the nonscheduled operator

In addition to the transcontinental route, Air America has been active between New York and Miami, Chicago and Miami and other points, CAB declared The Board said the carrier has advertised for and accepted passengers for its services from among the general public

▶Charge Pool Agreement—CAB also charged that since Apr 20, 1949, Air America has maintained an agreement with Viking Airlines, another nonsked,

providing for combined Air America-Viking services between Los Angeles, San Francisco and New York. Viking and practically all other major non-scheduled carriers have previously been cited by CAB for illegal activity.

According to CAB enforcement attorneys, Viking and Air America "pooled and apportioned" transcontinental traffic obtained from ticket agents used by both. The Board said Viking and Air America agreed on rotation and alternation of flights and dates on which each carrier would provide transcontinental service. They are also alleged to have pooled and interchanged equipment and facilities.

The combined Air America-Viking service was frequent and regular, exceeding the number of trips permitted by the nonscheduled exemption, CAB declared. It added that the alleged agreement had never been filed with the Board and was in violation of the Civil Aeronautics Act.

Air America is one of a number of nonskeds seeking a certificate for transcontinental coach type service. Hearings on the applications began early this year.

New U.K. Airliner Tours Planned

Great Britain is putting its new fleet of commercial transports through last phases of testing before they are sent on demonstrations and proving flights over seas.

▶**Comet**—British Overseas Airways Corp., which has 14 de Havilland Comets on order, will send the four-jet airliner on proving flights over Empire routes possibly as far as Australia this year.

The ship may also visit Europe and fly to East Africa for hot weather trials. The Comet already has made one round-trip from England to North Africa in 6½ hr. flying time. It has made over 120 flights in all, totaling more than 150 hr. in the air.

▶**Brabazon**—The long-range, 290,000-lb. Bristol Brabazon, world's largest civil aircraft, may carry out trial flights over the Atlantic this year. Powered by eight Bristol Centaurus piston engines, the research plane made its first flight last September. Work is proceeding on the turboprop production version of the Brabazon.

▶**Apollo**—Armstrong Whitworth's four-engine medium-range Apollo turboprop transport is expected to visit Europe before summer.

▶**Viscount 700**—Prototype of the Vickers-Armstrongs Viscount "700" medium-range transport powered by four Rolls Royce Dart turboprops is expected to fly this summer and go on a European tour soon afterward. Smaller prototype version of the Vickers-Armstrongs Viscount has been flying since the summer of 1948.

Meanwhile, British factories are working on orders placed earlier for piston engined transports.

▶**Marathon**—Handley Page (Reading) Ltd. will soon fly a production 22-place Marathon I four-engine medium-range feederliner to New Zealand for demonstrations and trials. Stops will be made at several points in Australia and the Middle East on the homeward trip. Seven of the 40 Marathons on order with the company are for British European Airways.

▶**Ambassador**—Third prototype (the production version) of the twin-engine, medium-range Airspeed Ambassador is due to fly in April and may make trial flights to Europe during the coming summer.

British European Airways has ordered 20 Ambassadors.

▶**Hermes IV**—The four-engine, 40-place Hermes IV is on the point of delivery to British Overseas Airways Corp., which has ordered 25. They will be put in service on BOAC's African routes.

▶**Jetliner**—On this continent A. V. Roe Canada's four-jet, short/medium range Jetliner is completing pressurization tests and is expected to make trial flights over Canadian and U. S. routes shortly.

Plans are now underway to take the Jetliner to the Society of British Aircraft Constructors air show at Farnborough, England, later this year. After Farnborough the Jetliner may fly to Australia.

STEWARDESS STATION

A United Air Lines stewardess is shown manning her compact but complete control station in a UAL Stratocruiser recently placed in service on the California-Hawaii route. Cabin lighting and heating are controlled here. The telephone on the stewardess' left connects with the flight deck and lower level lounge.

Merger Approval

Air Commuting, Inc.'s proposed purchase of Metropolitan Aviation Corp. has been approved by CAB. Air Commuting holds a certificate for short-haul passenger and cargo operations in the New York City area, but has not started regular service under the franchise. Both Air Commuting and Metropolitan Aviation have applied to CAB for New York area helicopter service.

Dutch Carrier Folds

(McGraw-Hill World News)

Amsterdam—Aero Holland, a charter operation in which Dutch shipping concerns have had an interest, is winding up its service because of inability to compete with the state-aided KLM. Personnel have been dismissed, and the company's 18 aircraft are to be sold. Aero Holland is based at Ypenburg, near The Hague.

New Service

Central Purchasing Agency, specializing in airline purchasing and wholesale aviation parts and equipment, has been opened at Miami International Airport. George Lewis, formerly with LBS Aircraft Corp., is general manager.

Name Change Official

Pan American Airways officially became Pan American World Airways when the Civil Aeronautics Board recently reissued the carrier's certificate to reflect the change in name

TWA Plans For More Connies

TWA plans to increase its Constellation fleet to 61 planes with the purchase of six Model L-49s from Hughes Tool Co

At present, TWA has 23 L-49s and 12 of the newer Model 749 Constellations TWA ordered 20 Model 749s last June and will start taking delivery on them this spring

If CAB approves the latest transaction with Hughes, delivery on the six additional ships will start in February and be completed in time for peak spring and summer traffic on TWA's domestic and international routes The airline obtained CAB permission to buy two L-49s from Hughes Tool Co last February

▶ **To Up Air Coach Capacity**—The additional L-49s will help TWA in its proposed change of transcontinental air coach equipment from 60 passenger DC 4s to 70-or more passenger Constellations This switch (Aviation Week, Jan 23), if approved by CAB, will give the carrier postwar coach equipment to meet the competition of American Airlines, which plans to substitute 70 passenger DC 6s for 70-passenger DC 4 air coaches in April

Although the tariff provides for a Feb 17 effective date, TWA's coach-type Constellations probably will not be available until a later date

Meanwhile, there is a possibility that TWA will soon dispose of its five Boeing 307 Stratoliners The prewar four-engine craft are now being used on the New York Pittsburgh-Chicago coach run, but the carrier has asked CAB permission to replace them with DC-4s TWA also wants to put DC-4s on the Kansas City-Wichita Amarillo-Albuquerque-Phoenix Los Angeles coach run now operated with DC 3s

Next-of-Kin Bill

Airlines are expected to fight proposed new federal legislation which would require passengers to register not only their own full name and address prior to a flight but also the name and address of a person to be notified in event of a crash

▶ **Unfairness Hit**—Industry officials said the bill, introduced by Rep Thomas J Lane (D, Mass) casts an unwarranted reflection on the safety of air travel and would hurt traffic seriously—especially where persons are taking their first airline trip "The bill imposes no burden on the railroads, buses and taxi operators—and they have accidents, too," one official commented

SHORTLINES

▶ **Aer Lingus**—The Irish airline carried a record 193,000 passengers in 1949, an increase of 13,000 over 1948

▶ **American**—Has declared the regular quarterly dividend of 87½ cents a share on its $3 50 cumulative convertible preferred stock, payable Mar 1 to stockholders of record Feb 15

▶ **American Shippers, Inc**—The Los Angeles, Calif, company is being investigated by CAB to determine if it has engaged indirectly in air transportation (as a freight forwarder) in violation of the Civil Aeronautics Act The firm holds no economic operating authority from CAB

▶ **Colonial**—plans to inaugurate nonstop DC-4 service between New York and Montreal on Feb 1 In the past, Colonial has used DC-3s on its U S and Canadian services, confining its DC-4s to the Bermuda run

▶ **Continental**—Has closed its Washington, D C, office Ronald C Kinsey, Washington vice president, is no longer with the carrier . . . Continental has asked CAB for an exemption to serve the oil-boom town of Snyder, Tex The city's population has soared from 6000 to 18,000 during the past year

▶ **Northwest**—Work on the company's $1,150,000 service base project at Wold-Chamberlain Field in the Twin Cities is 70 percent complete Largest of three new hangars is virtually finished It is 200 ft. deep by 175 ft wide and can accommodate two Stratocruisers or five Martin 2 0 2s Two remaining hangars, one of which is to be completed around Feb 1, will be 180 by 175 ft . . . NWA has signed an interline cargo agreement with the Flying Tiger Line

▶ **Pan American**—Flew approximately 61 400 passengers to and from Europe during 1949, an increase of 5400 over 1948 Breakdown showed 34,600 flying into the U S against 26 800 making the eastbound trip to Europe PAA expects trans-Atlantic traffic in 1950 to gain 30 percent over 1949 Besides the trans Atlantic run, PAA shuttled 22 500 honeymoon and vacation travelers to Bermuda last year . . . Pan American has resumed sightseeing flights over Miami in Convair-Liners at $3 a half-hour trip

▶ **Scandinavian Airlines**—Plans to operate nine trans-Atlantic roundtrips weekly between New York and Europe between May 15 and Oct 1. All flights

will be with DC-6s Current schedule is six roundtrips weekly

▶ **Servair Lines**—The Garland, Tex., company has asked CAB for a certificate to operate on schedule between Longview and McAllen-Mercedes-Harlingen, Tex

▶ **Southern Airways**—CAB has increased the feeder's temporary mail rate to 80 cents a plane mile between June 10 and Oct 31, 1949, 60 cents between Nov 1, 1949 and June 30, 1950, and 50 cents thereafter

▶ **Turner Airlines**—CAB public counsel has recommended that the feeder be awarded short haul routes in the North Central and Great Lakes areas originally granted to Parks Air Lines, which has never activated the links The new routes, extending to St. Louis, Chicago, Minneapolis, Sioux City and Des Moines would boost Turner's system mileage from 655 to 3200

▶ **United**—Flew almost 2,200,000 passengers in 1949, up 13 percent over 1948 Freight ton miles totaled 23,700,000 up 20 percent, mail ton miles 11,170,000, up 15 percent; and express ton miles 6,738,000, down 8 percent

▶ **Wiggins Airways**—Late last month expected to activate two new routes between Boston and Albany, one serving Lawrence Mass, and Manchester and Keene N H, and the other serving Fitchburg-Leominster, Orange-Athol, Greenfield-Turners Falls and Adams-North Adams, Mass

CAB SCHEDULE

Jan 30—Hearing in Trans-Texas Airways certificate renewal case (Docket 5726 et al)

Jan 31—Prehearing conference on TWA and American Overseas Airlines requests to suspend service at Philadelphia on trans-Atlantic routes Postponed from Jan 23 (Dockets 4228 and 4229)

Feb 1—Hearing on application of Transportes Aereos Nacionales for Honduras-Miami foreign air carrier permit. (Docket 4822)

Feb 6—Hearing on air freight accumulation assembly and distribution tariffs Postponed from Jan 23 (Docket 1705 et al)

Feb. 6—Hearing in New York area helicopter case (Docket 946 et al)

Feb 15—Hearing on Eastern Air Lines and National Airlines summer excursion fares (Docket 4166)

Feb 20—Hearing in Colonial Airlines mail rate case Postponed from Feb 6 (Docket 2724)

Feb. 20—Hearing in West Coast Airlines certificate renewal case. (Docket 3566 et al)

Feb 24—Hearing on CAB's enforcement action against Meteor Air Transport (Docket 4106)

Feb 27—Hearing in Panagra mail rate case. (Docket 2755)

Mar 1—Oral argument in North Atlantic route transfer case. (Docket 3538 et al)

Mar 6—Hearing on Twin Cities—Washington and Detroit—Washington through service investigation. (Docket 3661)

Mar 13—Hearing on enforcement proceeding against National Travel Club Inc. (Docket 4134)

Mar 14—Hearing on enforcement action against Peninsular Air Transport, Associated Airlines Agency and National Air Coach Systems (Docket 4084)

SEARCHLIGHT SECTION

EMPLOYMENT · BUSINESS · OPPORTUNITIES · EQUIPMENT—USED or RESALE

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NEW ADVERTISEMENTS received Friday will appear in the issue mailed the following Friday subject to limitations of space available

A. W

PILOTS AND CREWMEN

Pilots, Co-Pilots, Radiomen Navigators wanted for overseas operations Give complete details of qualifications, experience and personal history

P2044 Aviation Week
68 Post St, San Francisco 4, Calif

AIRCRAFT SEATING ENGINEER

Wanted by progressive midwest manufacturer to develop a line of military aircraft crew seats. Must be thoroughly experienced Please state complete background and salary expected Write

P-1772, Aviation Week
330 W. 42nd Street, New York 18, N Y

REPLIES (Box No.) Address to office nearest you
NEW YORK 330 W 42nd St (18)
CHICAGO 520 N Michigan Ave (11)
SAN FRANCISCO 68 Post St. (4)

POSITIONS VACANT

WANTED—SALES Executive Must have extensive sales management experience to direct and coordinate existing sales departments each dealing in specialized technical fields in administration of Government contracts sale of specially engineered products to aircraft manufacturers, also selling controls for industrial use radio in personal airplanes and sound equipment in specialized consumer fields. Must be experienced in guiding and directing advertising programs and analyzing potential markets and operating records. Technical background desirable but not essential Good business judgment and operating and planning experience required One employees knew of this advertisement Location Mid West. P-2043 Aviation Week

POSITIONS WANTED

SALES PROMOTION Regional sales manager assistant to general sales manager of leading personal aircraft manufacturer Airline background 7 years Operation sales and transoceanic navigator Proven sales ability Pilot. Age 33. A-1 references PW-1871 Aviation Week.

AERODYNAMICIST - EXPERIENCED. Five years jet aircraft design United States and Great Britain PW 1938 Aviation Week.

AIRLINE PILOT—ATR—2180 hrs. Bus Admin degree honor student. Desires position on company pilot or administrative assistant knowledge shorthand typing PW 2117 Aviation Week

AERONAUTICAL ENGINEER—Grad 1944—4 yrs. experience flight test engineer Have worked with jet propelled aircraft and guided missiles Will consider all offers, including sales Resume on request. PW 2085 Aviation Week

FOR SALE

For Sale—Ercoupes,
All Piper Models, Stinsons zero time and used, Navions and other models Write for details, also free listings P O Box 70 Consultants for Personal Aviation, Parkersburg West Virginia.

WANTED—AT-6's

Have you for sale a currently licensed and good-conditioned AT-6 Buyers interested in one or more! Send all information aircraft record no. of hrs. heal asking price and where located Reply immediately to

W 2928 Aviation Week
330 W 42nd St. New York 18 N Y

DOUGLAS DC3C-SIC3G – N54099

Exterior—showing step door

Interior—looking aft

POWER PLANT
Two Pratt & Whitney R 1830-92 engines
Total Time—Right 784 30
Left 530 41
Time since Overhaul—Right 191:26
Left 20 41
Air Transport Category Overhauls

PROPELLERS
Hamilton Standard Hydromatic 23E50-473
Total Time—1259 00
Time since Overhaul—180:00

AIRFRAME
Total Time—4378:53

INTERIOR
24 Reclinable Warren MacArthur Seats with Removable Covers
Heavy Eng Split Along Floor to Facilitate 100-Hour Inspections
Cargo Floor Removed, New Split Floor Laid Down
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Selective Cabin Heating
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Thermos Bottle
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RADIO
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VHF Localizer
ADF
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WHAT'S NEW

New Books

"Development of Aircraft Engines" by Robert Schlaifer, and "Development of Aircraft Fuels" by S D Heron are two unique studies published in one volume, focussed primarily on the question How can government and industry work together to keep our technical research and development up to, or ahead of that in other countries?

The authors do a brilliant job of detailing historical development of engines, accessories, and fuels in the U S and Britain In his study, Mr Schlaifer notes that while the military services' attempts to carry out their own engine development have mostly been unsuccessful, the government has no way of escaping some technical intervention since it must choose among the projects offered by industry, and being a customer, must express its preferences for certain lines of development.

The problems in private and government financing of new projects is detailed with case studies, and an interesting comparison is made of American vs British practices

Mr Schlaifer does a very careful survey of jet engines, giving the story of the origins of the German jets and the relations between the Air Ministry and the firms in their subsequent development

Mr Heron traces aviation fuel progress from World War I through World War II, describing first attempts to use synthetic fuels growth of knowledge of performance of specific fuel components, and important establishment of agreed standard methods of rating anti knock values

He shows how the already difficult problems of supply during the last war were aggravated by certain unscientific prejudices concerning some types of fuel components

Published by Harvard Business School division of research, Soldiers Field, Boston, Mass, 754 pages, two appendices, indexed, price $575

New Literature

"Tips on Trade With Marshall Plan Countries" is 46 page brochure explaining how to go about getting orders financed with ECA funds, discusses future of ECA business, and lists forms of ECA assistance available to small business, products ECA countries are likely to want, etc Available by writing National Assn of Manufacturers, 14 W 49 St, New York, N Y

ADVERTISERS INDEX
AVIATION WEEK
JANUARY 30, 1950

SEARCHLIGHT SECTION
(Classified Advertising)

EDITORIAL

Capital Leads Again

Over a year ago, Capital Airlines started air coach service, the first of the scheduled lines to take this bold step domestically. Actually, this was only one of a long list of decisions President J. H. Carmichael has made in a drastic but effective cost cutting, sales-building program.

Largely as a result of these efforts, Capital's vigorous comeback of last year was one of the most outstanding in an industry which made a rule rather than an exception of impressive recoveries from the traffic slump and ensuing widespread deficits of 1946-1948.

When Mr. Carmichael was named president early in October, 1947, Capital was close to disaster. Its planes were flying almost empty, and the net loss for the year was climbing toward its final total of $2,652,000. All orders for new postwar equipment had been canceled. Banks were uneasy about their $4-million loan to a company delinquent in interest payments on some $9,850,000 in debentures. The books showed liabilities exceeding assets. There were grave doubts that enough cash could be scraped together to meet the next payroll.

But hard-headed, economy minded management, aided by a more liberal mail pay formula from CAB and a general turn for the better in airline traffic, provided the vigor Capital needed.

The 1947 loss became a $123,000 profit in 1948 and an estimated $850,000 profit in 1949. Five Constellations and three Super DC-3s ordered in recent months will see service this year. The $4-million bank loan of two years ago is down to $300,000 and is slated to be paid off completely by Feb. 1. Outstanding debentures have been cut to $7,246,000, and all sinking fund requirements again have been met.

Last year's profits showed the result of diligent plugging for new business. Passenger revenues rose from $16,127,000 in 1948 to $19,826,000 in 1949. In comparison, mail pay was cut nearly $350,000.

And while the domestic airlines as a group boosted their passenger traffic last year about 14 percent, Capital with the help of air coach, lifted its passenger business a fat 28 percent.

The company, however, was far from making air coach its sole hope. During the past two years this regional carrier has led the industry in charter flights. To attract more first riders, it offered large-scale sightseeing flights at Washington, Cleveland and Pittsburgh early last year, and may resume the practice this year.

Now Capital has lifted the industry's airbrows by adopting the Goodyear cross-wind landing wheel system for its new Super DC-3s. It is the first major carrier in the country to accept this new but promising aid.

Installation in DC-3s of built-in passenger ramps, baggage racks and waist-high cargo doors has speeded the line's short-haul service and increased revenues.

The carrier is making no boastful predictions for 1950. No crystal-gazer, President Carmichael was surprised by the extent of his company's traffic and financial comeback in 1949. But he has reached the firm conviction that when you get more and more people to fly while keeping strict control over costs, the profits will take care of themselves.

This is the recent case history, in brief, of one airline. It appears to merit the attention of others.

The Real Test?

It can be debated whether the Civil Aeronautics Board's action last week in denying Pan American World Airways the right to conduct daily charter flights to Rome under contract with Felix Roma came to grips with the basic issue. The Board's tentative approval of this service several months ago brought discussion into the air transport industry as to the effect of such approval on the value of a certificate of convenience and necessity. The present decision does not of itself uphold the inviolability of a certificate.

The Board's decision was based primarily on two aspects. Whether the proposed service would truly be for "limited" group travel, as opposed to travel for any kind of group, and whether it would divert passengers from regularly scheduled service.

After concluding that the PAA-Felix Roma arrangement was open to any of the 25 million U. S. Catholics, the Board logically had to conclude that "charter" flights of even a small fraction of that number would be diversionary. But unstated in that reasoning is whether diversion in itself is the proper criterion.

Should a comparative handful of passengers choose a charter flight to Rome, rather than use the services of regularly certificated Atlantic carriers, it is obvious that such diversion would not in itself harm the existing Atlantic carriers. But observers might properly ask whether the mere authorization of any charter service direct to Rome—regardless of the diversionary aspect—does not impinge on the basic value of a CAB certificate. One of the tests for such a certificate is ability to perform the authorized service. When CAB invites charter service to a point served by a certificate carrier, does the Board thereby question the ability of the certificated carrier?

It is to be hoped that the Board later will clarify that question for the many who for years have regarded a C&N certificate as a solemn pledge of government faith in a carrier's fitness, willingness and ability to perform.

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